# MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 9 SEPTEMBER, 1936 Number 4


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IVER W. LEE
Pacific Coast Manager
949 Maple Ave.,
Los Angeles
Phone Vandike 3916

GEORGE H. MEYERS
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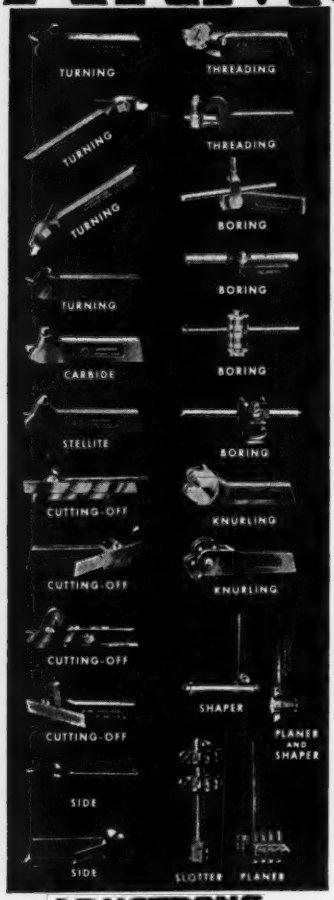


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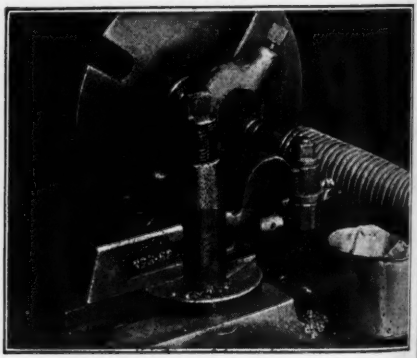

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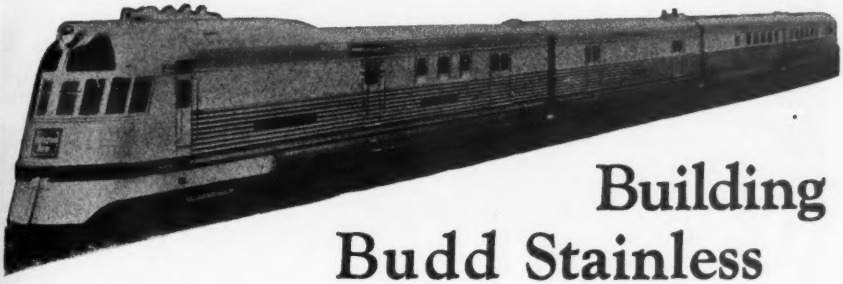


# Building Budd Stainless Steel Railway Cars

*Light-weight streamlined trains are revolutionizing railway transportation. This article tells how these cars are built in the plant of the Edward G. Budd Manufacturing Company, Philadelphia, Penna.*

BY HOWARD CAMPBELL

ON November 11, 1934, the first streamlined train in America was placed in operation on a regular passenger schedule. This train had previously made a non-stop run of 1015 miles—from Chicago to Denver—in 13 hours, or at an average speed of 77.6 miles per hour. At one period of the trip the train was traveling at a speed of 112.5 miles per hour. No stops were made for fuel or water during the entire trip. The entire amount of fuel-oil used was 418 gallons, costing $16.72.

During the less than two years which have elapsed since the first streamlined train was put on a regular schedule a number of similar trains have been put into service in all sections of the country. The development of these trains comprises a long step forward in railway transportation, due mostly to the comparative light weight of the units of which the trains are composed.

While, to the student of railway transportation, the necessity for reducing the dead weight in railway rolling stock has been apparent for many years, railroad passenger equip-

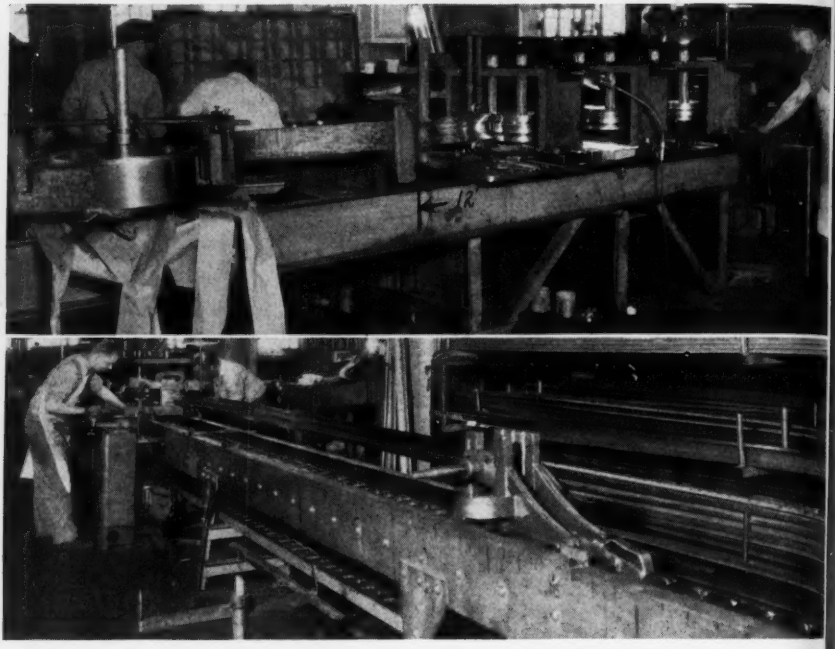


**Fig. 1 (Above)—Forming box-section trusses from stainless steel strips. Fig 2 (Below)—As the section emerges from the rolls, it is carried by this traveling support, which keeps it straight.**

ment in general has been growing steadily heavier and more expensive to move. The desirability of lighter weight units has been recognized by all railway men, and they have consistently been searching for ways and means to reduce weight in mobile structures.

It has remained for the engineers of the Edward G. Budd Mfg. Company, however, to find the answer to the problem. This answer lay in the use of alloy steels, particularly of the "stainless" type. It was discovered that the so-called 18-8 (18% chrome and 8% nickel) stainless steel has a ductility equal to that of mild steel and can be manipulated quite as easily as mild steel if sufficient power is used. The problem now became a problem of fabrication.

Riveting is less efficient on thin sections of high tensile steel than on mild steels, and spot welding, as commonly practiced, seemed to be quite unsuited for the task. The welds were brittle, and the metal for quite a distance around the weld was rendered inferior to mild steel. However, through a series of long experiments it was found that extremely rapid heating and instant cooling of the molten metal results in a good weld. The attainment of this objective involved the development of a new type of welding equipment, the process thus used being known as "Shotweld."

When "Shotweld" welding equipment is used, the application of the current for from 1/60 to 10/60 of a second — depending upon the thickness of the metal — results in a melt-

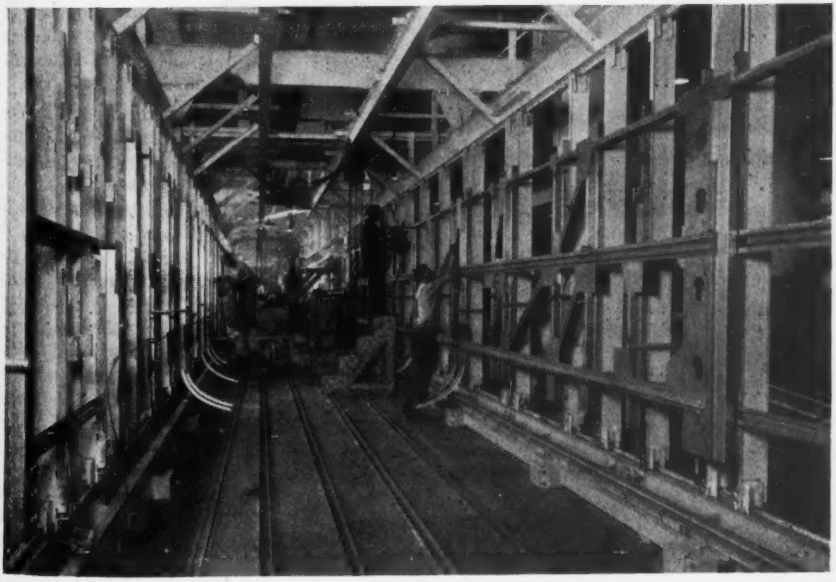
ing of the steel sufficient to make it intermingle and if the current is on only for this extremely short space of time, the surrounding cold metal will instantly chill the molten metal, resulting in checking the segregation and leaving the metal in an austenitic condition. The welds will withstand torsion up to 90 degrees, and develop a shearing strength of 90,000 lb. per square inch.

The Budd form of truss construction, employing built-up sections of thin-gauge stainless steel, is used. The truss members are generally of box sections formed of deep flanged channels and cover plates joined by the "Shotweld" system. The 18-8 steel of which these sections are formed has a minimum tensile strength of 150,000 per sq. in. and an elastic limit of 120,000 lbs. per sq. in. with satisfactory ductility.

The box sections are formed in the machine shown in Fig. 1. The machine consists primarily of three sets of rolls, each set consisting of two rolls of which one is the male and the other the female member. The steel, which is simply a continuous flat strip of the width and thickness required, comes in a roll which is placed on the spool of the machine, as shown. The end of the strip is threaded through the rolls and is then engaged by a pulling dog which draws out the formed piece to the desired length. The machine is actually a rolling folder or brake.

The forming of the steel strip into the shape desired is progressive; that is, the first pair of rolls are so made that the forming is one-third completed, the second pair of rolls leaves the strip two-thirds formed, and the last pair of rolls completes the forming operation. As the formed end of the strip emerges from the rolls,

**Fig. 3—The huge jig in which the side frames are built. When the pair of side frames is completed, they are moved to a track to be assembled with the under-structure and roof.**



it is clamped in the pulling dog previously referred to and shown in the immediate foreground in Fig. 2. This dog rides on a track of sufficient length to accommodate the longest section required, and keeps the section straight while forming.

Three different parts of a car are in process of assembly at the same time; the under-frame, the side skeletons, and the roof. Figure 3 shows the huge jig in which the side frame-

Fig. 4—View of side frame, showing vertical struts in position.

work is put together, with some of the side members in place. In assembling the side frames the outside horizontal moulding, which is of 0.060-in. steel, is clamped in place first, then the vertical posts are clamped in position and welded. Two of the welders, using "Shotweld" welding machines, are shown in the illustration. A side frame with the vertical struts in position is shown in Fig. 4.

After the vertical posts and horizontal mouldings have been welded, the diagonal struts are anchored in place, followed by the inside horizontal mouldings. The floor supports are now put in and welded, followed by the channels between the inside and outside horizontal mouldings. Belly supports are now welded to the ends of the curved pieces, the whole length of the car. The welds average 1 in. apart. The gussets, which are of both 0.040-in. and 0.060-in. stainless steel, are also welded in.

The floor is made up of corrugated sheet stainless steel, the bottoms of the rectangular corrugations of which are welded to a flat sheet, both in turn being welded to the longitudinal stringers of which there are 10 to a car, crosswise. These, in turn, are secured to transverse supports built into the car frame. In baggage compartments the floor is designed for a load of 600 lb. per lineal foot.

The roof is designed to assume the entire compression load. It is built up of longitudinal corrugated sheets welded to roof carlines and locally reinforced at points of maximum stress. Longitudinal trusses which extend from end to end of each underbody between the sides and center sills serve to add torsional stiffness to the entire structure and are reinforced at the step wells. Between them is a clear space, closed with light hatch covers, in which all piping, tanks, and so on are located.

Figure 5 shows the huge jig, or form, over which the roof is constructed. The jig is made with hori-

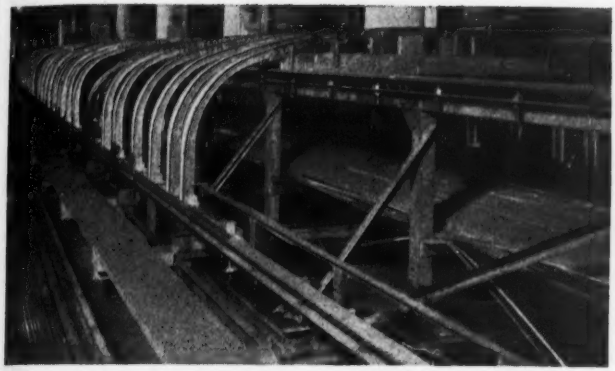


Fig. 5—The car roof is built over this form, which is shown with some of the roof supports in position.

zontal supports upon which the horizontal sections of the roof are located. The cross sections, which have been formed and curved to shape, are now placed in position, spaced at regular intervals the entire length of the roof, as shown. With the supporting members in place, together with the gussets, the entire framework is welded in the same manner as the side frames. Stainless steel sheets are now welded to the frame, and the roof is ready to be assembled to the car.

The engine bed, fabricated by Lukenweld, Inc., is a rigid arc-welded structure of steel plate, annealed after completion of the welding. It forms a combination bumper, engine bed, and bolster. The material is Lukens Steel Company "Cromansil", with a tensile strength of 90,000 lb. and an elastic limit of 70,000 lb. and possessing a high resistance to fatigue and shock. It is built into the lower chord member of the side trusses and forms the foundation for the nose structure of the power car.

The articulation castings are tied into the car bodies by riveting to the end posts and frame and also to the Cromansil reinforcements at the ends of the center sills. No rivets other than those connecting the end-sill castings, engine beds, needle beams and the rear bolster beam to the side frame are used in the car structure. The transverse horizontal arms of the castings extend out only far enough to carry the side bearings, and the load is carried to the side frames through the end truss structure.

The job shown in Fig. 6 is one of

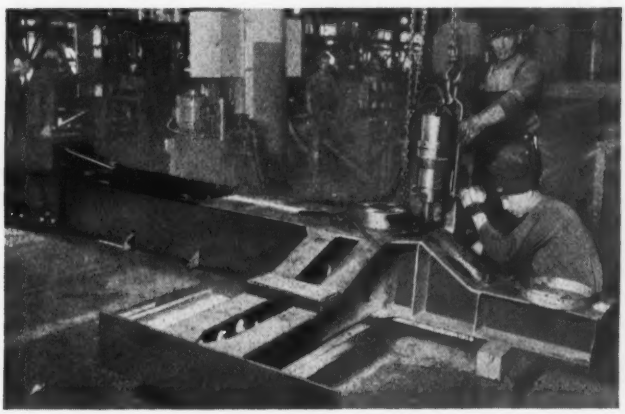


Fig. 6 — Riveting a center pin plate to an under frame. This is one of the few places where rivets are used in the construction of stainless steel cars.

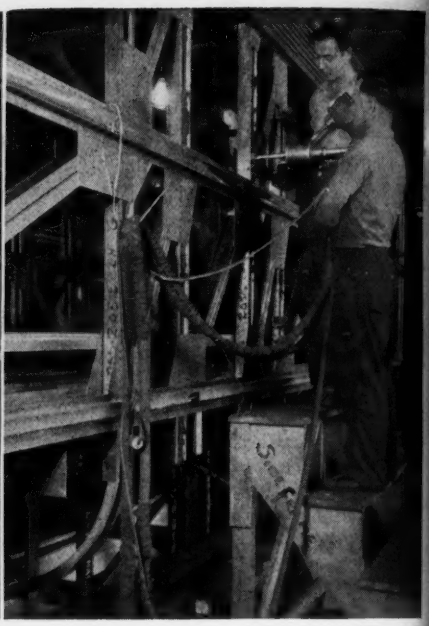


**Fig. 7 (Left)—Assembling an end-frame to the under-structure. Fig. 8 (Right)—Assembling a side-frame to a car. The mechanics are using a "Shotweld" welding machine, which performs the welding operation so quickly that surrounding metal is unaffected by the heat.**

the few places where rivets are used in the building of stainless steel cars. Here the mechanics are shown riveting a center pin plate to an under-frame. Twelve ¾-in. steel rivets are used in assembling these parts, the riveting being done with the aid of an air "header." The pin for which this center pin plate is provided is 4⅛ in. in diameter.

After the under-structure has been assembled and the floor laid, the end frames are set up as shown in Fig. 7. The end-frames serve as locating points and supports for the side frames, and also for the roof.

The mechanics shown in Fig. 8 are engaged in assembling the side frame to the car, using a "Shotweld" welding machine for the purpose. The electrical mechanism is contained in a box-like structure which is supported on iron wheels, but the contact points are built into a portable unit resembling a large "C" clamp, one at the contacting end of the curved part and the other at the end of a plunger which is held in contact with the work by means of compressed air. The services of two operators are required to hold the unit in the correct position when it is being used on the side or roof of the car, but it can be handled by one operator when the work is in a more convenient position, as shown in Fig. 9.

The assembling of the under-frame and floor, the sides, and the roof is shown in Fig. 10. From here on the car rides on its own wheels, moving along to the side assembly, interior

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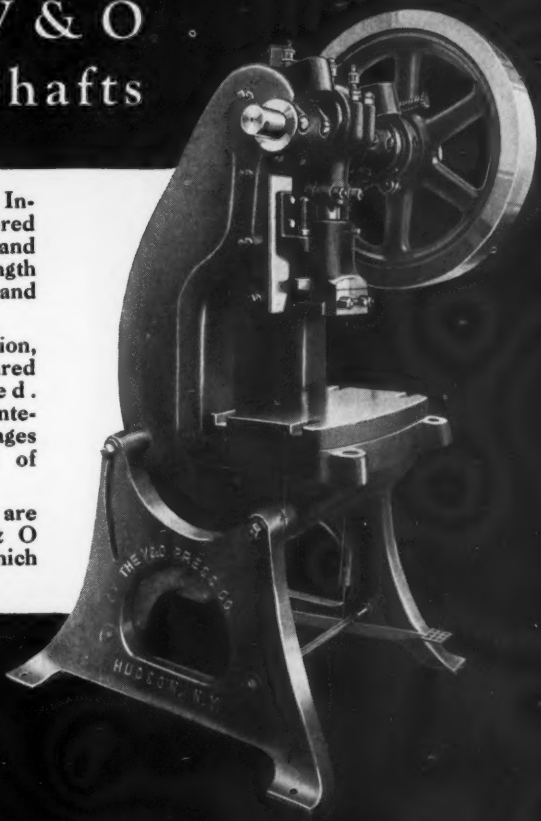


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construction, painting and recorating, upholstering, and so on until it emerges ready for use.

The space below the floor level is enclosed with light corrugated sheathing similar to the roofing with light hatch sections under the center. This sheathing is insulated with ½-in. hair felt stitched between two layers of 80-lb. waterproof kraft paper, the outer side of which is cemented to

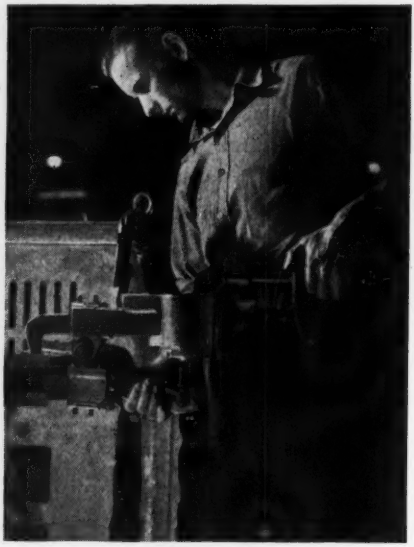


Fig. 9—Welding operator using "Shotweld" electric welder.

the sheathing—an arrangement which dampens resonance. The side walls and roofs of the cars are insulated throughout with a 2-in. "Dry-Zero" blanket. This material is very light in weight and combines low conductivity with added sound-deadening qualities.

In the coach compartments the side walls and headlining are finished with Masonite panels. The headlining in the lounge compartment is of molded Agasote. The walls of the baggage compartments are of corrugated galvanized sheets and the floors are laid with 5/16-in. cork tile, cemented to the corrugated steel flooring. Swing type double doors are provided at the step wells, which are closed by trap doors. The bottom step folds up when the trap is closed and, with the doors, forms an unbroken surface with the adjoining outside sheathing.

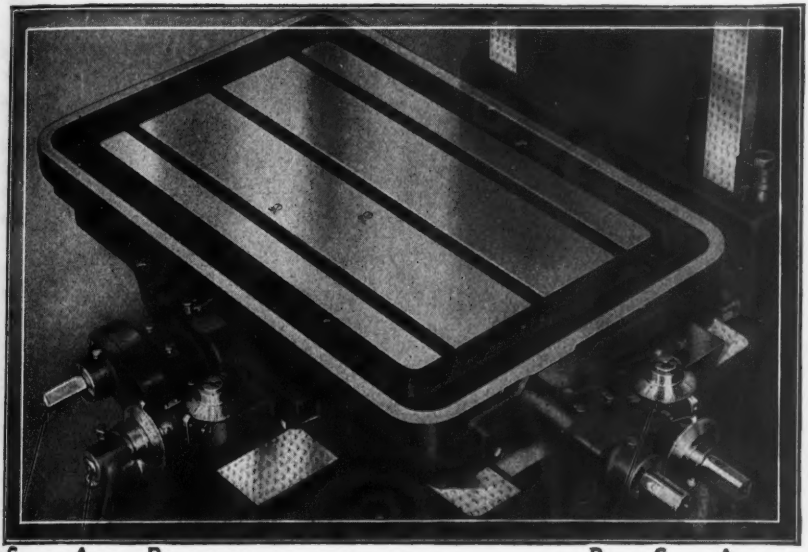
All side windows are flush with the outer surface of the car. The window units are equipped with two sheets of ¼-in. special Duplate shatter-proof glass, separated by a ¼-in. space from which the air has been displaced by nitrogen, thus preventing icing or fogging of the windows in cold weather.

The power plant was designed by the Electro-Motive Corporation, the prime mover being a Winton 600 h.p. high compression, two cycle, 8 x 10-in., eight-in-line Diesel engine. Power for all auxiliaries is taken from the engine in excess of its 600 h. p. rating at 700 r.p.m. A 75-cu. ft. per minute Gardner-Denver air compressor is driven directly from the rear end of the crankshaft of the engine.

The electric equipment, including the main generator, exciter, auxiliary generator and traction motors was built by the General Electric Company. The main generator is a single-bearing differentially-wound machine mounted ahead of the engine and directly connected through a flexible steel disc coupling.

The power truck, carrying the weight of the power plant, has 36-in. wheels and hollow-bored axles. The trailer trucks are considerably lighter in construction and run on 33-in. wheels. All journals are fitted with Timken Roller Bearings.

Rubber inserts are used extensively in the trucks. There are inserts under the center plate, in both top and bottom equalizer spring seats and between the ends of the equalizers and

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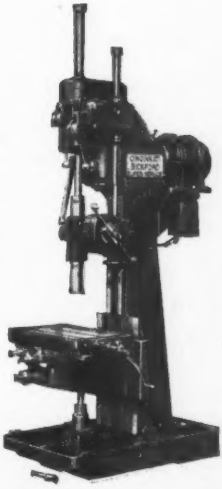

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**THE CINCINNATI BICKFORD TOOL CO.**

**Oakley, Cincinnati, Ohio, U. S. A.**

**Fig. 10—Assembling the roof to the side frames.**

the journal boxes. The bolster chafing plates are of hardened spring steel, but are insulated from the frame by vulcanized pads of sound-deadening rubber. Rubber thimbles are also provided around the king pin.

Helical-volute springs are used on the equalizers of the first truck only. These springs consist of the conventional helical outer coil with an inner volute spring in place of the inner helical coil. To dampen horizontal oscillations at high speeds, Houdaille double-acting hydraulic railroad shock absorbers are installed between the bolster and truck transoms on all trucks.

Not only is the dampening a benefit in eliminating uncomfortable side sway, but the double acting features of the shock absorbers also prevent the bolster from striking when the train enters a curve with a poor approach. The center plate bearing, the bearing between the articulation castings, and the side bearings are all faced with Oilite.

The train is equipped with Westinghouse HSC brake equipment, which has been especially developed for use with high speed articulated train units and is adaptable to any length of multi-unit train. This is an electro-pneumatic brake with straight air brake available in case of electric failure, or failure of the straight air service brake. The brake operation is initiated from the brake valve in the usual manner.

While not intended as a complete description of the trains now being built by the Edward G. Budd Mfg. Co., the above will enable the reader to draw a fairly clear picture of the main features of design and construction of these modern railway transportation units.

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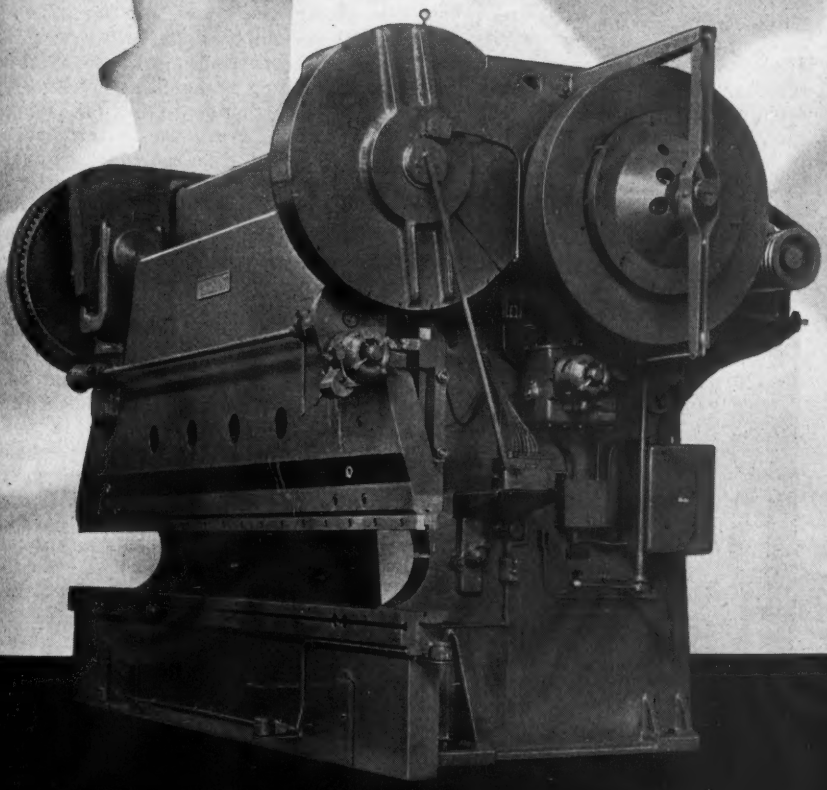


THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

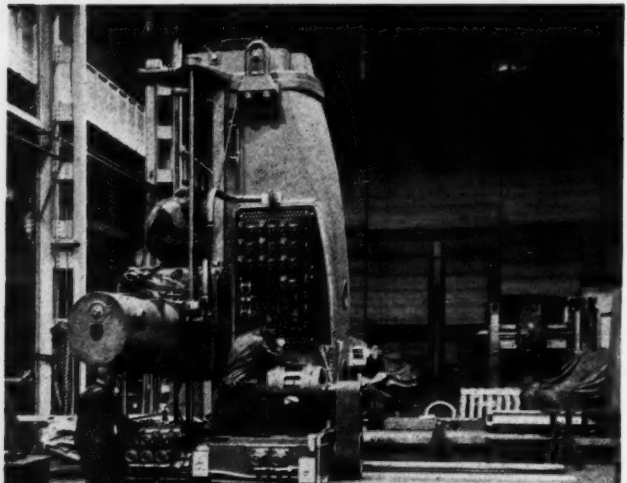
# Better Lighting Achieved Without Rewiring

By W. E. Rutz,
**Works Manager, Giddings & Lewis Machine Tool Company**

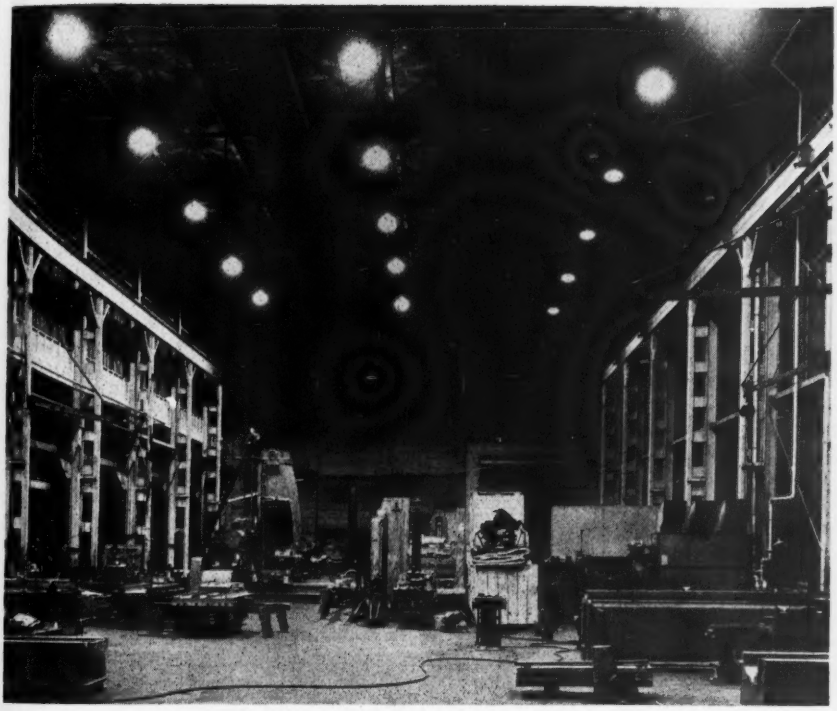
WHEN an alloy steel of new physical properties is introduced, most of us are immediately interested in the composition which makes these new properties possible. Usually it turns out that the seemingly minor ingredients are responsible for the striking results. The necessity for good workmanship in the manufacture of precision machine tools, however, is such "old stuff" that analyses of conditions affecting it do not always come in for the same detailed consideration. The importance of qualified, well-trained workmen and modern tools and test instruments is taken for granted, but the seemingly minor components that determine good workmanship may not be judged by equally critical standards.

Some years ago, at the time our new assembly department was built for the construction of horizontal boring, drilling and milling machines, an effort was made to include, for consideration, every factor that had any bearing on the working conditions. We immediately decided that the ability to see well was a most important factor, and one that had been too frequently overlooked in the past.

Now in the assembling of such equipment as our product consists of, it is not always possible to arrange so that all precision work can be carried on



**Precision operations at levels 15 or more feet apart on both horizontal and vertical surfaces create a difficult lighting problem.**



**Erecting department at Giddings & Lewis Machine Tool Company, showing the new "high-intensity" lighting installation.**

where an abundance of daylight will be available. Operations involving precision workmanship are to be found in every department of the shop, and often the machine itself is so positioned that it blocks out a great deal of the light. In consideration of this fact, a building of the modern "daylight" type was constructed, the walls of which consist largely of windows. On most days this large window area provides a satisfactory amount of light, and the improvement in working efficiency was immediately apparent.

However, artificial lighting was necessary for dark and evening hours, for which the plant was equipped with 500-watt incandescent lamps in a standard type of reflector. In order to clear the tops of the highest machines and also the crane which traveled the length of the building above them it was necessary to mount the lamps 39 feet from the floor. Spaced on 20 x 20-ft. centers, the lamps provided from four to seven foot-candles of light at the working level when daylight was entirely absent.

As an auxiliary light source in the late afternoon when there was still some daylight, the amount of light afforded by this system was adequate, but it was far from ideal for continuous work at night. The adoption of shorter working hours and an increase in the demand for the machine tools which comprise our product presently made additional night work

necessary and thus again brought the lighting problem to the fore.

Unlike some production operations, it is impossible to assure good seeing conditions by providing special lighting at certain fixed locations. In the installation of gear mechanisms on spindles, and on similar other operations, for instance, clear visibility is equally important on both horizontal and vertical planes, from six inches to some 18 feet above the floor.

In order that the workmen might proceed with their tasks efficiently, auxiliary lights were provided in the form of both stand lamps and hand lamps which were shifted about as required to throw the light where it was needed. Thus both from the standpoint of both adequate lighting and of economy we were anxious to get away from the variable characteristics of such a lighting system, with the inconvenience of shifting lights at frequent intervals, repairing worn extension cords, and so on.

For a time we considered replacing our 500-watt lamps with 1,000-watt bulbs. Investigation showed, however, that the wiring would not take this extra load, and that we would have to add the cost of a complete rewiring job to the cost of the extra current which would be required to operate the new lamps.

We finally came to the conclusion that the situation was sufficiently serious to warrant an investigation by a lighting specialist, so one of the engineers of the General Electric Vapor Lamp Company was called in to make a survey. After making the necessary studies he recommended an illumination of 15 foot candles or more from the overhead units for the assembly floor, which was about three times the amount of light we were then obtaining from our overhead lighting system as equipped with 500-watt lamps. The most interesting point, however, was the statement that this could be achieved **without rewiring** and without any increase in the amount of electrical energy used.

We proceeded upon the specialist's recommendations, and replaced each of our 500-watt incandescent lamps with 400-watt units of the high-intensity mercury vapor type. These lamps are several times as efficient in light output per watt as the incandescent type, consequently we achieved the 15 foot-candle level with an actual decrease in the amount of current consumed.

Just for comparison, we calculated what our operating costs for light would have been had we gone to the expense of rewiring our plant and using 1,000-watt incandescent lamps to obtain the same amount of light that was now provided by the 400-watt mercury vapor lamps.

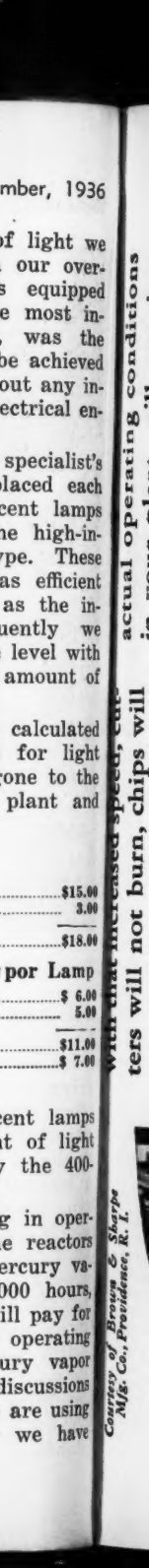
**1,000-Watt Incandescent Lamp**

| | |
|---|---|
| Current @ $0.015 per lamp per 1,000 hours | $15.00 |
| Renewals per lamp per 1,000 hours | 3.00 |
| Total operating cost per 1,000 hours | $18.00 |

**400-Watt High Intensity Mercury Vapor Lamp**

| | |
|---|---|
| Current @ $0.006 per lamp per 1,000 hours | $ 6.00 |
| Renewals per lamp per 1,000 hours | 5.00 |
| Total operating cost per 1,000 hours | $11.00 |
| Saving per 1,000 hours | $ 7.00 |

On this basis, the saving in operating cost will pay for the reactors required to operate the mercury vapor lamps in the first 1,000 hours, and the next 1,400 hours will pay for the lamps themselves. The operating life guarantee of a mercury vapor lamp is 2,000 hours, but in discussions of lighting with others who are using the mercury vapor lamps we have

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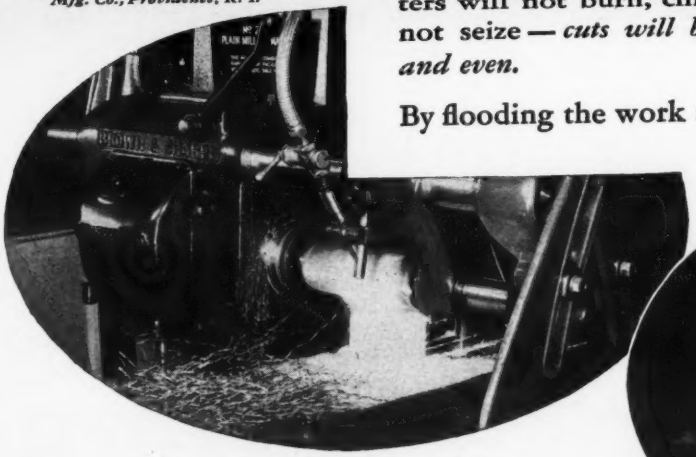
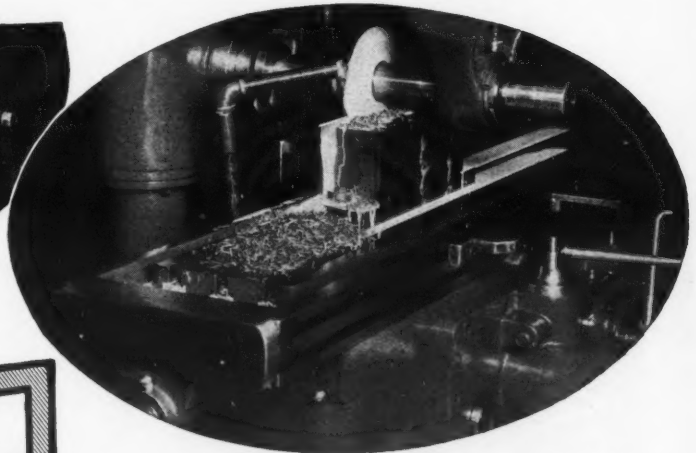
*Courtesy of Brown & Sharpe Mfg. Co., Providence, R. I.*



with that increased speed, cutters will not burn, chips will not seize — *cuts will be clean and even.*

By flooding the work and the actual operating conditions in your plant, will convince you that it increases output and improves quality in the milling operations.



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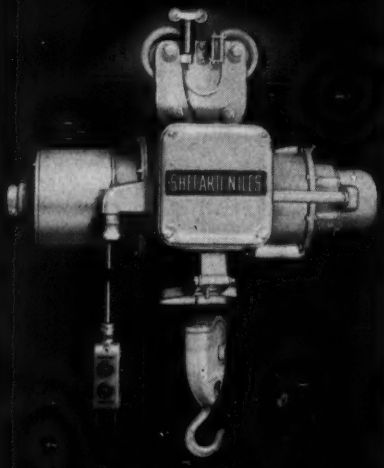


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learned that a lamp will almost invariably run many hours over this length of time. Naturally, the cost comparison proved its own case so far as our decision was concerned.

In the several months that the new lamps have been in operation a number of other factors have come to light which have confirmed our decision. For instance, the light from the new units appears to be considerably superior in its visual quality and freedom from shadows and glare to that previously obtained by combining portable lamps with the weak overhead lighting. This even light distribution is apparent to some extent in the photograph of the erecting floor where some of our mechanics are shown assembling a No. 70 High Power Precision Horizontal Boring Machine. The best evidence on this score, however, is obtained from the workmen themselves, who are now performing precision operations on the night shifts with a degree of facility that meets "daylight" standards in every respect.

The favorable reaction from the men working in this department regarding the new type of high-intensity mercury vapor lighting has been a major factor in our decision to extend the use of these lamps to other parts of the plant in the near future. So far as we are concerned, this type of lighting appears to be a paying proposition from the standpoint of operating cost, production efficiency, and employee morale.

---

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# Methods Engineering Procedure: Selecting a Wage Incentive Plan

*In this article the author describes the essential features of the best-known plans and outlines their advantages.*

By H. B. Maynard

President, Methods Engineering Council, Inc., Pittsburgh, Pa.

THERE are certain definite advantages to be gained from the payment for labor under some form of wage incentive plan. In effect, the operator is put into business for himself. This encourages a steady effort and secures an interest in the work which is noticeably lacking in day workers. Operators on incentive not only work willingly, but they study methods and processes themselves and tend to develop greater skill. Labor costs are relatively fixed under incentive plans and are almost always lower than on day work.

To be successful, a wage incentive plan must be operated in conjunction with proper methods engineering work. Good efficient working methods must be established and taught to the operators, and the time for performing the work must be accurately measured. This is the foundation for all that is to follow and is by far the most important step of the installation.

When the plan is introduced, it should be set up with safeguards to prevent abuses, and in such a way that payment is made according to the results achieved. If the production of parts of a standard quality is the goal, the plan should be based upon the number of pieces produced which pass inspection. If the conservation of material is important, then the factor of the ratio of the number of pieces produced to the amount of material used should be introduced. Factors which give rewards for improving quality, reducing scrap, reporting regularly for work, or saving material, can be added to any wage payment plan if conditions make it necessary.

Finally, the plan should be thoroughly explained to the operators and should at all times be administered fairly with the interests of all those affected in mind. The steps of the introduction and administration of an incentive installation will be fully discussed in a subsequent article.

To summarize, the installation of a wage incentive plan should be preceded by careful methods studies and accurate rate setting. The plan selected should then be properly set up,

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introduced, and administered.

If all this is done — and it involves, of course, careful work on the part of executives and experienced methods engineers — the particular wage incentive plan used is relatively unimportant. In view of the sweeping claims which have been made concerning the advantages of certain individual systems, this statement may at first glance seem somewhat unusual, but a careful analysis of some of the recognized wage incentive plans will bear this out. If the true workings of the various incentive plans are understood, it will be readily seen that there are several good plans, several that are not so good, and none that is ideal.

A large number of wage incentive plans have been devised. Most of these, however, are modifications of certain well known plans which have been in existence for a number of years. It is the purpose of this article to analyze briefly 11 of these plans, and in so doing not only to discuss the plans themselves but to show how any wage incentive plan may be judged easily and quickly.

### Performance Efficiency — Earnings Curve

Many and varied are the formulas used for computing earnings under incentive plans. Although formulas may be useful for the actual computations themselves, they do not give a good idea of how earnings vary with performance efficiency. A much clearer idea is obtained by plotting a curve. If performance efficiency is plotted against earnings, not only are the workings of the plan made clear, but a comparison of the way earnings vary under a number of different plans can easily be made.

Under many systems, the point of average performance is the point at which bonus payments begin. It is arbitrarily, and strictly speaking, incorrectly, designated as the point of 100 per cent efficiency. If the allowed time is not met, the operator is said to be less than 100 per cent efficient, nd he receives his minimum guaranteed rate for the time taken; if the allowed time is bettered, he is more than 100 per cent efficient and receives a bonus in proportion to the amount by which he betters the allowed time. If average performance is the basis used for bonus payments, time values established by the methods described in the article entitled "Methods Engineering Procedure: Time Study" which appeared in the January, 1936, issue of Modern Machine Shop may be applied without adjustment.

Some systems use as a basis performances other than average, and when this is the case, adjustments must be made. For example, there is a plan under which the operator delivering average performance is expected to make a bonus of 33⅓ per cent. Another system considers a performance with excessive effort and super-skill as 100 per cent. Bonus payments start with about 45 per cent efficiency. With plans that consider average performance as other than 100 per cent, time allowances established as described in the previous article must be adjusted, but this is a matter of simple multiplication. The plans which are described in this article set average performance at 100 per cent efficiency.

### Characteristics of a Good Wage Incentive Plan

To be thoroughly satisfactory to both operators and management, a wage incentive plan must possess certain characteristics. The most important of these are four in number and may be stated as follows:

1. Plan must be easy for operator to understand.

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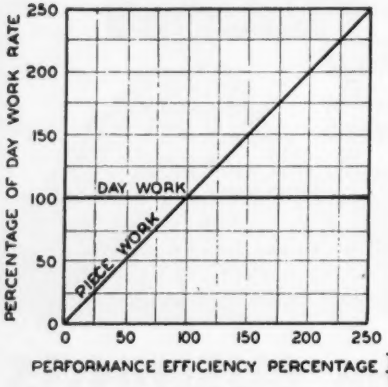
2. Plan must be economical to administer.
3. Plan must offer an incentive.
4. Plan must provide a minimum guaranteed rate.

Some employers still feel that the lack of a minimum guaranteed rate offers a strong incentive to produce. Unquestionably it does, but other factors, particularly worry over the possibility of receiving low earnings when production for some unusual reason is low, have a negative effect upon the worker which seriously impairs his efficiency. Most modern industries consider the minimum guaranteed rate necessary, economical, and humane.



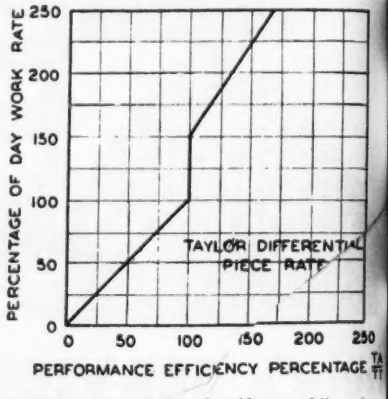




**Fig. 1—(Left) Chart showing relation of earnings to performance under the "day-work" system. Fig. 2—(Right) Chart showing how Taylor Differential Piece Rate Plan provides an incentive to produce above a given point.**

### Leading Wage Incentive Plans

The two wage payment plans most widely used are the straight day work and the straight piece work plans. The reason for this lies in their simplicity. Day work earnings are figured from the formula

$$TT \times DR = \text{Earnings}$$

where TT = time taken and DR = the day work rate.

The operator is paid for the time he works regardless of the amount he produces. There is no incentive offered to increase production. A large percentage of all industrial work is still done on the day work basis. Figure 1 shows the way earnings vary with performance.

Under the straight piece work system, the operator is paid only for what he produces. Straight piece work offers a high incentive but penalizes the worker who does not attain average performance. Earnings are easy to figure. The formula is

$$TA \text{ (Base rate)} = \text{Earnings}$$

where TA = time allowed. If allowances are expressed in time the formula is used as given, and the wage payment plan is known as the 100 per cent premium plan. If the base rate is multiplied by the time value and a money allowance is established, the plan is known as piece work.

As far as earnings go, it makes no difference whether the allowance is expressed in time or money if the base rate is the same. When base rates are subject to fluctuation as in times of economic readjustment, it is a de-

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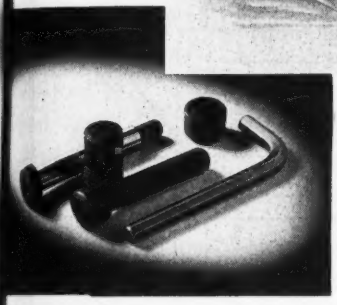

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cided advantage to have allowances expressed in hours, as it is then necessary to adjust only the base rates of the operators. If money allowances are used, each allowance must be changed. Allowances expressed in time are also more useful to such departments as the production and machine tool equipment departments.

Time values form the basis for delivery and equipment estimates, whereas money values are practically meaningless in this connection. It is also more complicated to reward operators for such items as loyalty, ingenuity, and length of service under piece work, for the same piece rate applies to all operators. Under any plan which uses time allowances, although the time values are fixed, the base rates of the operators can be varied to give the more valuable men the higher earnings.

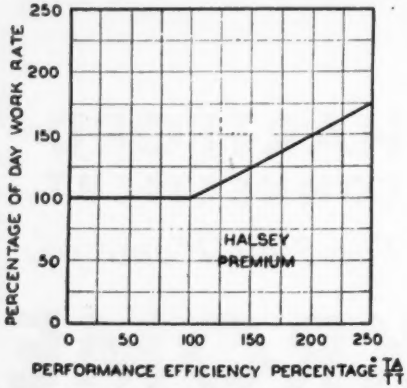
The Taylor Differential Piece Rate Plan differs from the straight piece work plan in that two piece rates are established. If a worker meets or betters a predetermined performance, he is paid at a high piece rate for what he produces. If he fails to equal the predetermined performance, he is paid at a lower piece rate. Here the incentive to produce is a maximum, for the penalty for not producing is severe. The plan has all of the disadvantages of piece work plus the complication of two rates, and it is not much used.

The Halsey Premium Plan has been used by many concerns, particularly when time allowances are established inaccurately by estimate. It allows the worker only a part of the time saved and hence prevents "running away" with liberal time allowances. Earnings are calculated from the formula

$$[TT+F\ (TA—TT)]\ DR = \text{Earnings}$$

after the time allowance has been met. F is an incentive factor. It is usually 50 per cent but may be 33⅓ per cent or any other factor. In effect, the worker who betters the time allowance receives a bonus equal to F multiplied by the time saved.

The Gantt Task and Bonus Plan offers a rather low guaranteed rate and offers a strong incentive to meet or better standard performance by paying for output after the point of "make-out" at a much higher rate, in



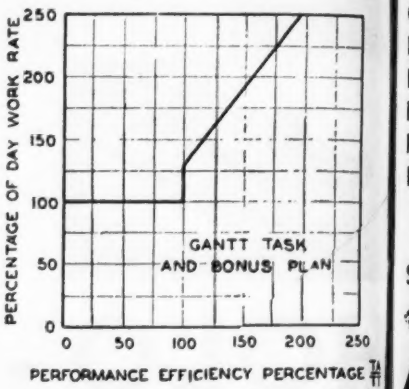




**Fig. 3—(Left) The Halsey Premium Plan offers a bonus based on savings in time. Fig. 4—(Right) The Gantt Task and Bonus Plan provides for a higher rate when "standard" performance is bettered.**

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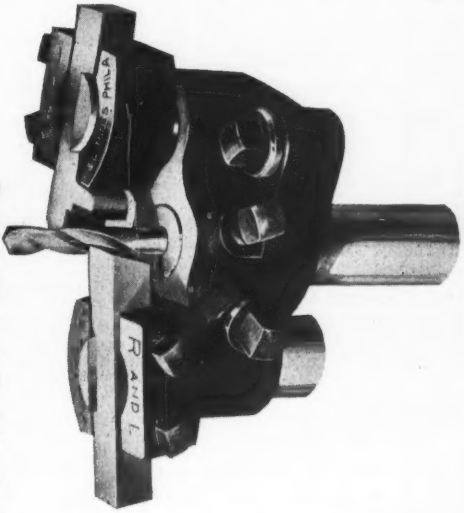


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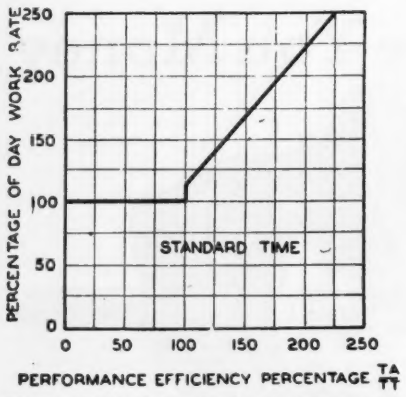


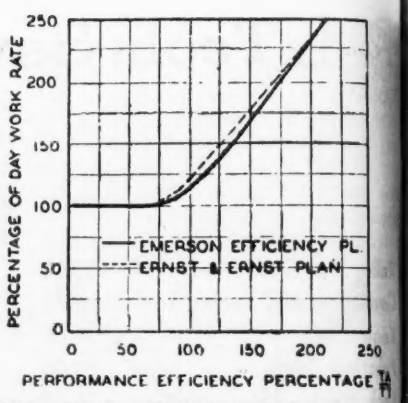


**Fig. 5—(Left) Under the Standard Time Plan, a higher rate is paid after standard performance is attained and the earnings are then directly proportional to output. Fig. 6—(Right) Under the Emerson Efficiency System, bonus payments begin at 67 per cent of a standard time efficiency and increase as efficiency increases.**

accordance with the formula

$$[TA+F\ (TA)]\ DR = \text{Earnings}$$

F is usually 30 per cent, but may be higher or lower. The plan is comparatively simple, but the low guaranteed rate makes it somewhat difficult to administer. A modified plan calls for a guaranteed rate equal to the average rate paid in the district and uses a value for F of 10 per cent. There seem to be few disadvantages to the modified plan.

The standard time plan is another modification of the Gantt Task and Bonus Plan. Each operator has a low rate and a high rate, but the high rate is only 11 per cent higher than the low rate. The low rate is usually the average rate paid in the district for the class of work the operator does, thus making the hiring of new men comparatively easy. Before standard performance is attained, the operator is paid for time taken at the low or day work rate. After standard performance is attained earnings are calculated from the formula

$$TA(\text{Standard Time Rate}) = \text{Earnings}$$

After standard performance is met, earnings are directly proportional to output. The two rates have a tendency to confuse those who do not thoroughly understand the plan.

The Emerson Efficiency Plan is a fairly well known plan and is used sometimes as originally devised and sometimes as modified to meet special conditions. Under the original plan, bonus payments begin with 67 per cent efficiency and increase as efficiency increases as shown by the solid curve in Figure 6. Earnings are calculated from the formula

$$[TA+F\ (TA)]\ DR = \text{Earnings}$$

Values of F vary in accordance with a special table.

The Ernst and Ernst Plan is similar to the Emerson Plan. Starting with a 1 per cent bonus for an efficiency of 75 per cent, the bonus percentage increases 0.6 per cent for each increase of 1 per cent in efficiency up to 90 per cent; then 1 per cent for each additional 1 per cent increase in efficiency up to 100 per cent; and 1.2 per cent for each additional 1 per cent increase in efficiency over 100 per cent. These values plotted give the dotted curve shown on Figure 6 which follows the Emerson curve rather closely.

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Both these plans offer an incentive before 100 per cent efficiency is reached, and they offer a high incentive to increase efficiency over 100 per cent. They are somewhat complicated to understand and offer difficulties to payroll and accounting work which is avoided by systems which pay earnings in direct proportion to output.

The Rowan Plan is another classical wage payment plan. It offers a high incentive immediately after standard performance and a decreasing incentive as output is further increased. The maximum possible earnings are twice the day rate although in practice these earnings are never reached. Earnings are calculated from the formula

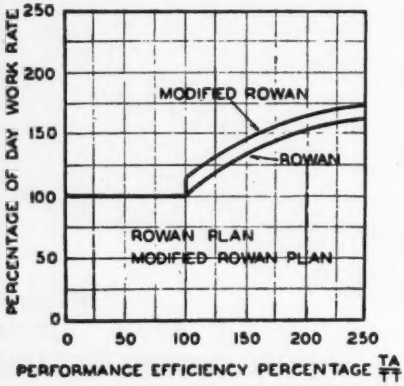
$$\left[TT+TT\left(\frac{TA-TT}{TA}\right)\right] DR=\text{Earnings}$$

A modification of this plan is also shown on Figure 7. After standard performance is reached it pays a high rate which is approximately 11 per cent higher than the day rate. It is in effect similar to the Standard Time Plan and the Rowan Plan combined and includes all of the objectionable features of each. Its chief advantages are that it offers a high incentive to reach standard performance and that it limits earnings to a definite amount, an important point when time values are loosely set or when they are established on unstandardized work. By the same token it also tends to limit output.

Under the Bedaux Plan, time values are expressed in B's instead of hours or minutes, but since 60 B's are equal to 60 minutes, this feature is not especially important. The formula used for wage payment varies in different installations. In some cases the Halsey formula is used, that is,

$$[TT+F\ (TA-TT)]\ DR=\text{Earnings}$$

The chief points of difference from the Halsey plan are that time values are established accurately and that management pays for all the time saved. F=.75 so 75 per cent of the time saved goes to the man. The other 25 per cent goes to the supervisors as a reward for assisting the men to increase their earnings. In other installations, no supervisory bonus is paid and operators' earnings are computed along a broken line curve which



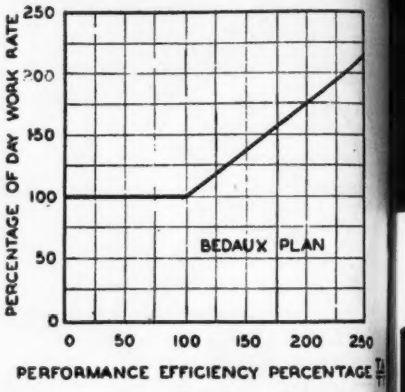
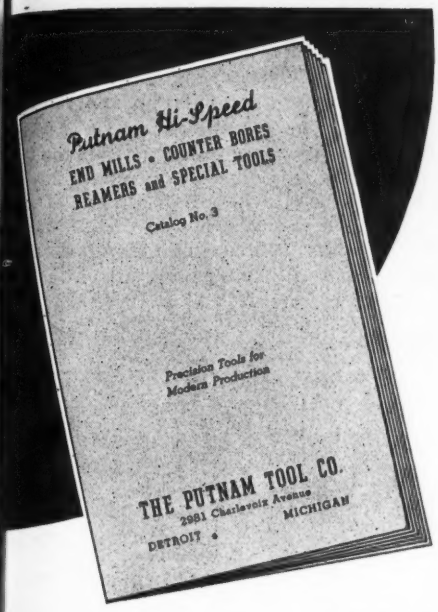




**Fig. 7—(Left) The Rowan Plan offers a high incentive to achieve standard performance, but the incentive decreases as output is further increased. Fig. 8—(Right) Under the Bedaux Plan time values are established accurately and all the time saved is paid for.**

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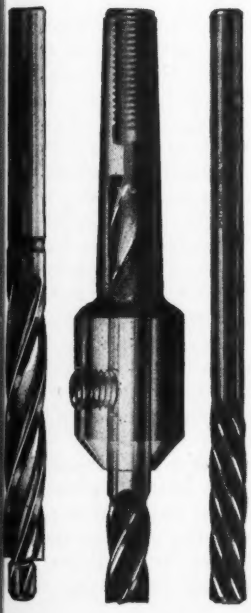

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closely approximates the Rowan curve.

### Selecting a Wage Incentive Plan

The management which wishes to secure the benefits of wage incentives is faced with the task of choosing from the plans described above, or from similar plans, one which will be suitable for its individual conditions.

It will be noted that, aside from day work, the plans are of three general types after the point of "make-out" is reached; namely, those which pay in direct proportion to the amount produced, those which give increasingly great rewards as production increases, and those which give decreasingly great rewards as production increases. The first class may be subdivided into plans which pay for all the time saved, such as piece work, 100 per cent premium, and standard time, and those which pay for only a portion of the time saved, as the Halsey Plan. An additional incentive to make out is furnished by plans which increase rewards materially at and beyond the point of make-out such as the Taylor Differential Piece Work Plan, the Standard Time Plan, and the Gantt Task and Bonus Plan.

Which plan is the best for general industrial application? A tabulation showing whether or not each plan possesses the four major characteristics which a good incentive pla should possess gives the following in formation.

From this tabulation, it may be see that no plan receives a favorabl rating in every respect but the Gant Task & Bonus Plan. Even this pla possesses the disadvantage of a lo hiring rate, although this is overcom in the modified plan mentioned above

At the same time, all of the plan listed are in use at the present ti so that it can not be said that t plans are altogether unsatisfactor As a matter of fact, they have brought good results to those us who have set them up properly. Pr lems are involved in administeri any one of them, however, which would be desirable to eliminate if p sible. For this reason, industry h shown a tendency to experiment cently and has been searching for b ter wage payment methods.

| Name of Wage Payment Plan | Easy for operator to understand | Economical to administer | Offers an incentive | Provides minimum guarantee rate |
|---|---|---|---|---|
| Day Work | Yes | Yes | No | Yes |
| Piece Work | Yes | Yes | Yes | *No |
| 100% Premium | Yes | Yes | Yes | *No |
| Taylor Diff. Piece Rate | Yes | Fair | Yes | *No |
| Halsey Premium | Yes | Yes | Fair | Yes |
| Gantt Task & Bonus | Yes | Yes | Yes | Yes |
| Standard Time | Fair | Yes | Yes | Yes |
| Emerson Efficiency | Fair | Fair | Yes | Yes |
| Ernst & Ernst | No | Fair | Yes | Yes |
| Rowan | No | No | Limited | Yes |
| Bedaux (Halsey) | Yes | Yes | Fair | Yes |

* *Can be provided if desired.*

Probably one of the most extre steps which has been taken is to ab don both incentives and hourly ra and place all operators on a strai salary basis.

A more conservative step which caused a great deal of discussion cently is the so-called return to h rates by a number of large industr Analysis shows that these pla however, instead of having retur

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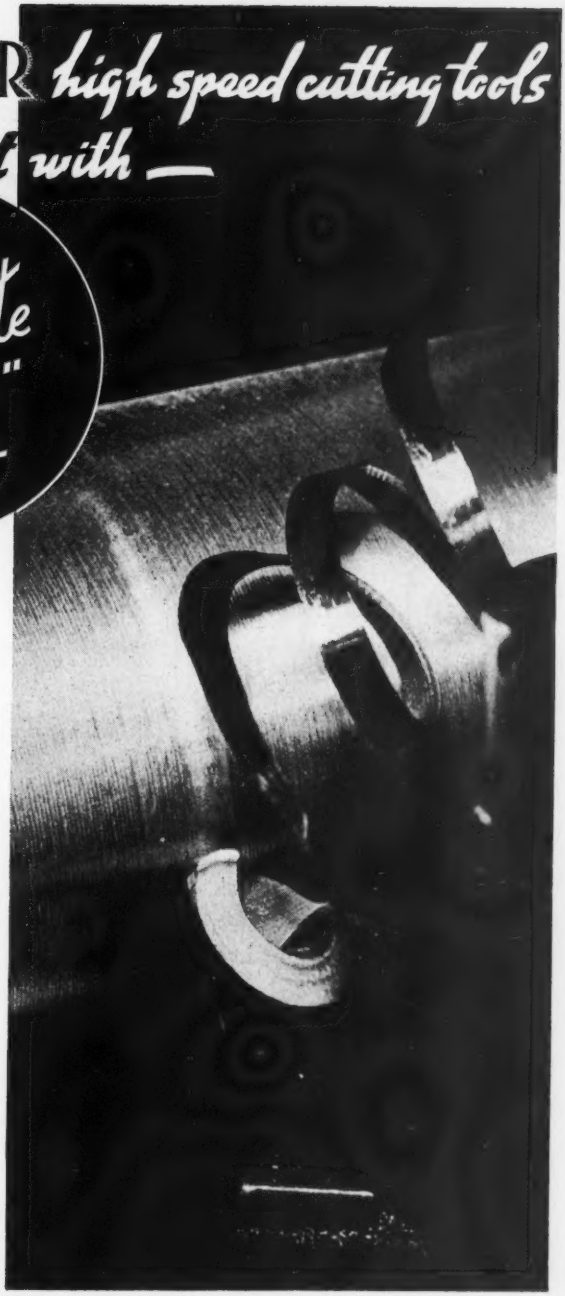

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to day work, have merely changed their form of incentive plan to one which is by no means new.

However, let us consider a plan which has as yet no recognized name. A certain standard production is established by careful methods study. This production must be attained after a reasonable learning period if the

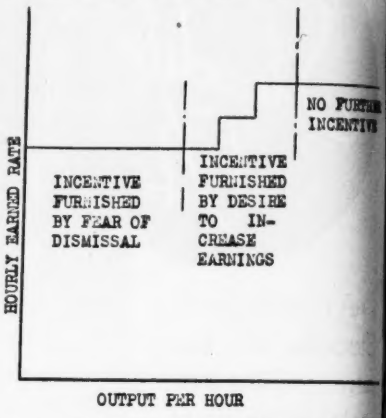
HOURLY EARNED RATE
INCENTIVE FURNISHED BY FEAR OF DISMISSAL
INCENTIVE FURNISHED BY DESIRE TO INCREASE EARNINGS
NO FURTHER INCENTIVE
OUTPUT PER HOUR

**Fig. 9—Chart illustrating a plan which is easy for the operator to understand, is economical to administer, provides a minimum guaranteed rate, and offers a limited incentive.**

operator is to retain his job. After standard production has been reached the operator is given encouragement to produce still more by offering him an increase in his hourly rate if he maintains a higher level of production. Usually there are three hourly rates paid for a given job, the minimum and two higher rates which are paid to the higher producers. After the highest hourly rate has been received, the operator can earn no more on that job.

Under this plan, there are three distinct zones from the incentive viewpoint, as is shown by Figure 9. Below the point of standard production, the spur to produce is the fear of dismissal. In the next zone, the incentive to produce is furnished by the desire

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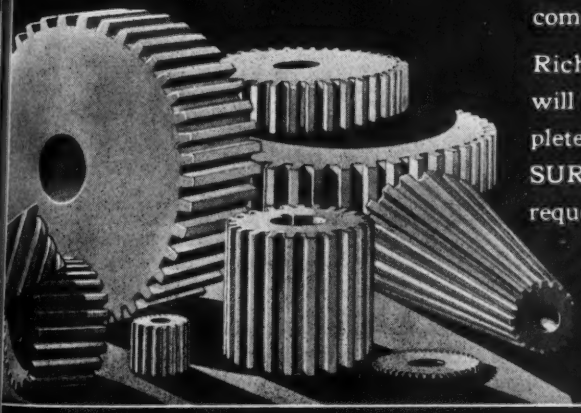

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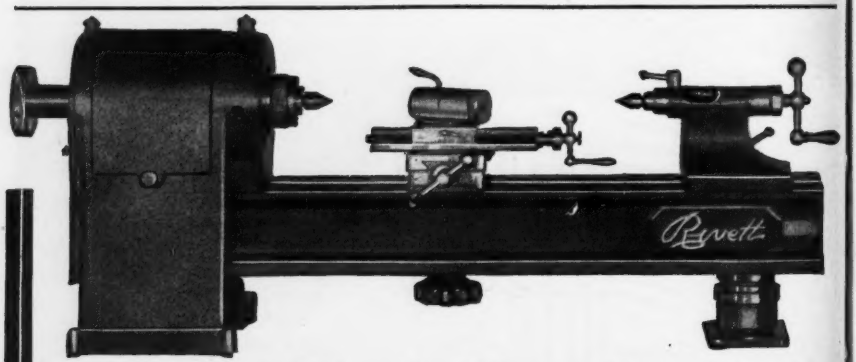
increase earnings. The incentive here is exactly the same as under the incentive plans described above, although the shape of the earnings curve is different. In the third zone, there is no further incentive to increase production. This plan is easy for the operator to understand, is fairly economical to administer, although up-to-the-minute performance records must be kept to make sure standard performance is being maintained, it offers a limited incentive, and provides a minimum guaranteed rate. The burden of maintaining production at the minimum standard rests on the supervision and creates certain difficulties from that standpoint. The plan like all the others is workable, although not free from disadvantages.

In the final analysis, therefore, one is forced to the conclusion that the ideal incentive plan has yet to be devised. At the same time, most plans are workable, give good results, and are liked by the majority of those who are accustomed to using them. The selection of a wage incentive plan is therefore pretty much a matter of individual preference. As long as methods studies are correctly made and the plan is properly set up, introduced, and administered, any plan but the most complicated will give results. It is preferable to choose the plan which has the fewest disadvantages, but there are a number which are on approximately the same level in this respect.

It seems unnecessary to have several wage payment plans in the same plant. Some plants have evidenced a tendency in the past to use a new plan every time a different class of work was placed on an incentive basis. On the other hand, many of the largest organizations have standardized on a single wage payment plan and have found no difficulty in apply-

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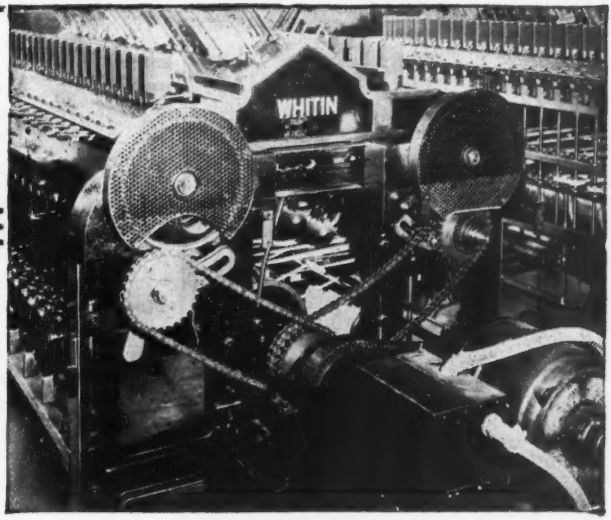


*(Photo courtesy of Whitin Machine Works)*

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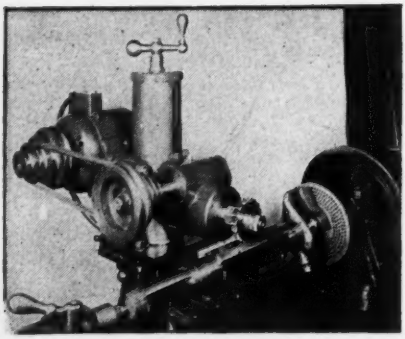

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*In writing for illustrated pamphlet, give size and make of lathe and inside dimensions of tool post T-slot. Representatives wanted.*

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ing it to a wide variety of operations.

The group system* can be used in connection with any of the wage payment plans mentioned above. This system is not a wage payment plan, but rather a method of distributing earnings. It is more difficult to apply to a plan which establishes money rates than one which uses time allowances. The group system presents a number of advantages on work where the performance of one operator affects that of another, or in other words, where there is a community of interest. On the basis of effort alone, however, the individual basis is the best, and therefore, care should be taken to organize groups only where group team-work is definitely required.

In conclusion, although many advantages are urged for any given system by those who are familiar with it, it will be found that most wage incentive plans possess merit. Of far more importance is the quality of the methods engineering work upon which the plan rests and the fair administration of the plan after it has been set up.

*For a complete description of the group system see Chapter XL. "Time and motion Study and Formulas for Wage Incentives" by Lowry, Maynard, and Stegemerten, (McGraw-Hill Book Company, New York).

**DISSTON INSERTED TOOTH METAL CUTTING SAWS: THEIR SELECTION AND CARE** is the title of the third in a series of booklets being issued by Henry Disston & Sons, Inc., 521 Tacony St., Philadelphia, Pa. The booklet includes discussions on the selection and care of metal cutting saws, grinding teeth in improved interlock saws, and sharpening sectional interlocked teeth and gives dimensions for standard inserted tooth metal cutting saws, typical recommendations for improved interlock saws and sectional interlock saws, and specifications for cut-off machines in general use. Copy free upon request.

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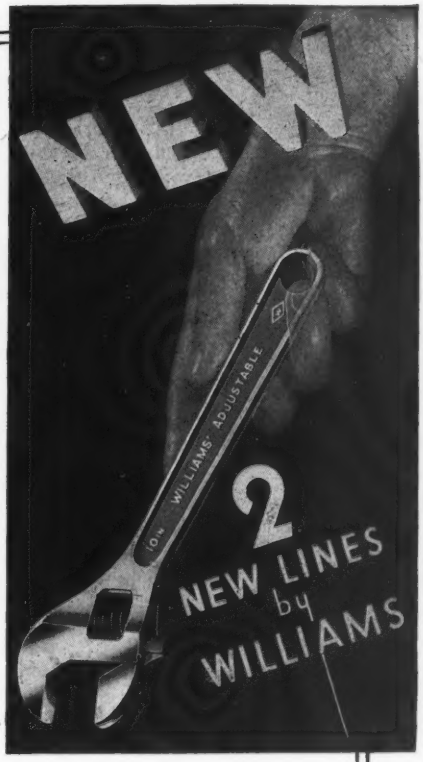


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# Methods Engineering Procedure: Correction

Reproduced here is the corrected version of the chart which was shown incorrectly on page 48 of the August number of this magazine. Inasmuch as the chart was an important feature of the article, we regret the error exceedingly and trust that none of our readers have been discommoded.

| Repetitiveness of Operation Cycle | Labor Content | Life of Job | Type of Study Indicated |
|---|---|---|---|
| High | High | Over 12 months | A |
| | | 6 to 12 months | A or B |
| | | Under 6 months | B or C |
| | Medium | Over 12 months | A or B |
| | | 6 to 12 months | B or C |
| | | Under 6 months | C |
| | Low | Over 12 months | B |
| | | 6 to 12 months | B or C |
| | | Under 6 months | C |
| Medium | High | Over 12 months | B |
| | | 6 to 12 months | B or C |
| | | Under 6 months | C |
| | Medium | Over 12 months | B or C |
| | | 6 to 12 months | C |
| | | Under 6 months | C or D |
| | Low | Over 12 months | C or E |
| | | 6 to 12 months | C, E or F |
| | | Under 6 months | F |
| Low | High | Over 12 months | C or D |
| | | 6 to 12 months | C, D or E |
| | | Under 6 months | C or E |
| | Medium | Over 12 months | C, D or E |
| | | 6 to 12 months | C or E |
| | | Under 6 months | C, E or F |
| | Low | Over 12 months | C or E |
| | | 6 to 12 months | C, E or F |
| | | Under 6 months | F |
| Jobbing | High | Under 6 months | E |
| | Medium | Under 6 months | E or F |
| | Low | Under 6 months | F |

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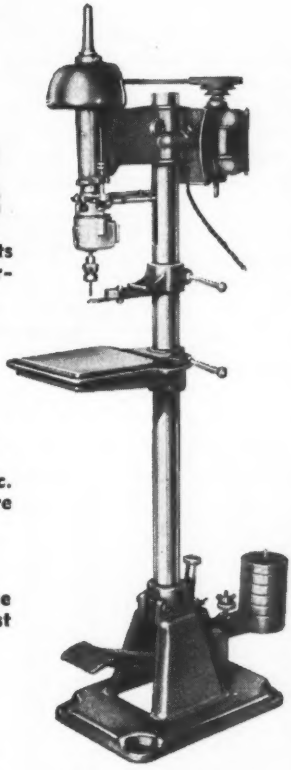

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See Bulletin No. 2 for seven sizes of Tapping Attachments for use on Drill Presses.

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# Materials Control Chart for the Smaller Plant

By John A. Honegger

THE illustration is a reproduction of a chart that is now in use in several plants for keeping track of the number of parts, quantities of bar stock or sheet stock, or materials which may be ordered in other units. The chart consists of the wall board A, to which is attached the chart board B, the two sections being necessary for reasons which will become apparent farther along in the article.

At equally spaced distances angular slots C are sawed vertically across the face of the board to accomodate the sliders D. The slider is best made from a narrow strip of tin, bent to the required shape with a little additional bending so that it will hug its

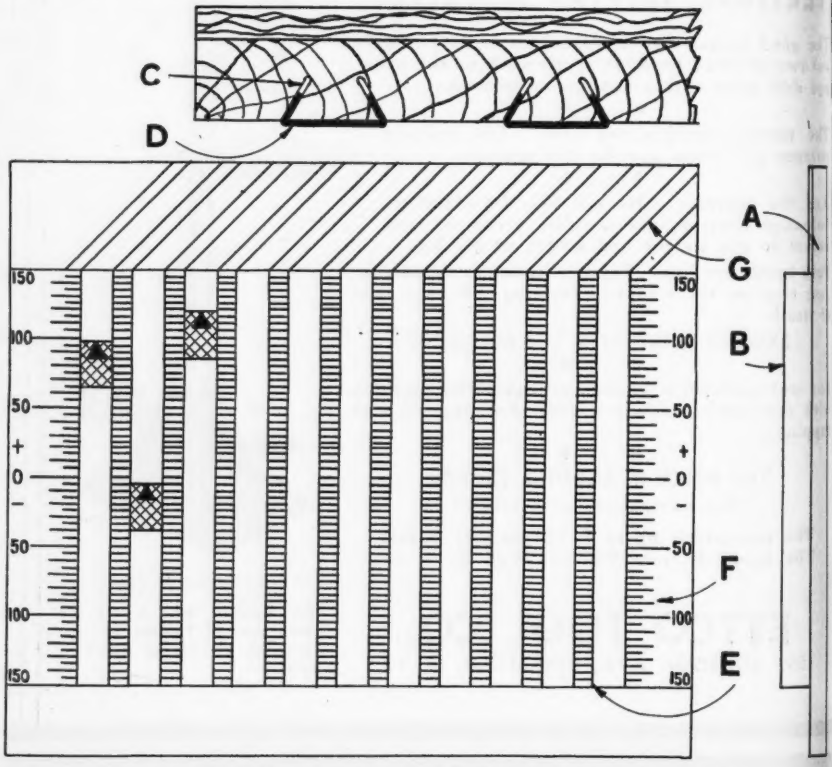
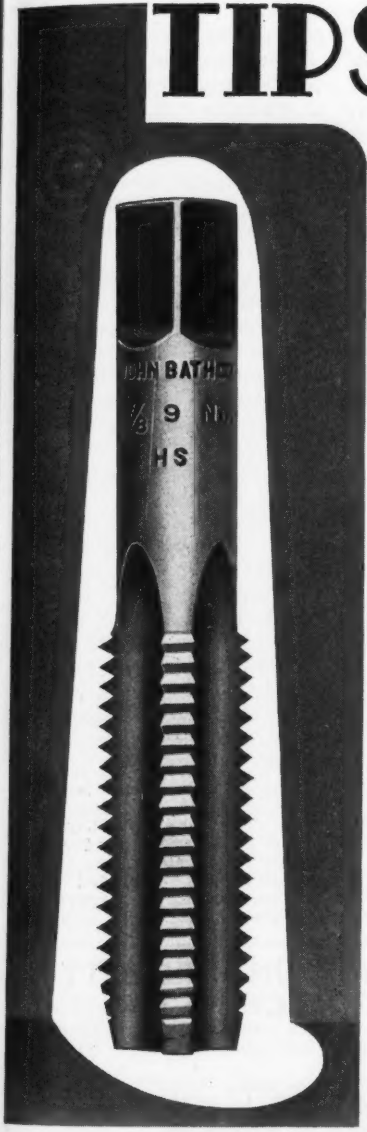



Diagram Illustrating Construction of Wall Board for Control Chart

# TIPS on TAPS

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**WORCESTER, MASS.**

SPECIFY BATH TAPS

tongue tightly and will not slip. The face of the chart is crossed with graduated lines E, equally spaced and terminating at each end into a graduated scale F which is numbered as indicated. As shown in the illustration, the lines have not been extended over the surface of the slider spaces, but actually the lines extend unbroken across the face of the board.

The angular spaces indicated at G at the top of the chart indicate holders, usually made of tin, which hold the slip of cardboard upon which the names of the parts or units or material are written or typed. Thus one column may designate parts of a certain kind while another indicates pounds of tacks or feet of bar stock.

The base line is the zero line, which is at the center of the chart. The number of units or amount of stock on hand in the stores department is indicated above the zero line, the space below the zero line being intended to indicate a deficit, or amount of material needed to finish current orders. On the chart shown, the maximum values are 150 units either way.

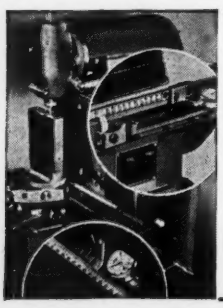
Thus as parts or units are placed in stores, the slider is moved upward to show the amount of material on hand, and as the parts or materials are withdrawn for production, the slider is moved downward accordingly. If an actual shortage occurs, the slider will be moved down to a point which will show the amount of the shortage.

In order to keep inventories within certain limitations and at the same time provide insurance against an actual shortage, a red mark can be made at any given point above the zero line to indicate to the production clerk that additional stock must be ordered when the slider is down to this point. Another mark can be made to indicate the maximum amount of stock considered necessary; thus when ordering, the order clerk will order only enough additional stock to bring the total on hand to the maximum point. However, it is usually better to use pins as indicators, due to the fact that the pins can easily be moved if the limitations are changed or if the designations of the units are changed.

The advantage of such a chart consists in that it comprises a visible record or "picture", so to speak, of the stock situation. The chart will instantly reflect, at all times, the situation in regard to the amount of stock unused and the necessity, if one exists, for additional stock in order to complete the orders in process.

---

**HEVI DUTY BULLETIN HD-636.** This four-page folder, now being issued by Hevi Duty Electric Co., Milwaukee, Wis., described in detail the Hevi Duty Furnace Element Construction and outlines the development of the various types of Hevi Duty Furnaces. Included in the folder are photographs and drawings of different kinds of furnaces. Copy free.



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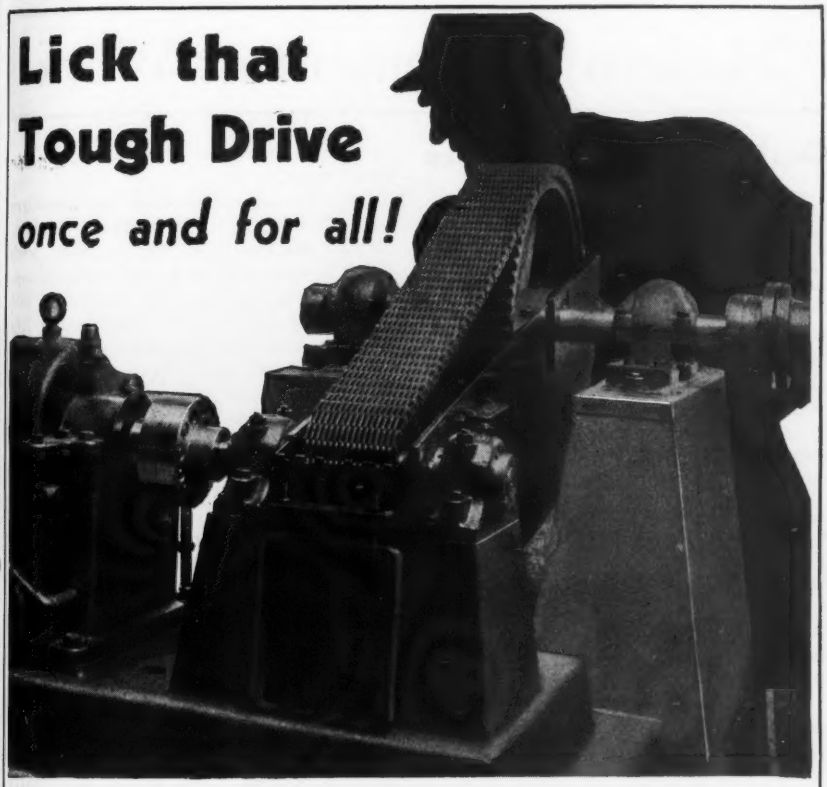

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# Modern Equipment at Work

## Can Manufacturer Electrifies Solder Baths

A PRACTICAL elimination of rejects and a 50 per cent reduction in fuel costs have resulted from the electrification of one of the solder pots used in continuous seam-soldering process by the Phillips Can Company, Cambridge, Md., and the successful results obtained from the first installation have led to the use of electric heat for the other seven pots employed in the process.

The first electrification consisted of a General Electric midget thermostat controlling four 3-kw. Calrod heating units installed on a pot that was formerly fired with gas. The pot, 60 inches long, was especially insulated for the purpose. Because the surface layer of acid flux is very corrosive, the units were of the "through-the-side" type.

The former operating temperature was 650 deg. F. The uniform temperature distribution obtainable with electric heat allows a reduction of operating temperature to between 600 and 620 F., contributing to longer life for the crucible, a substantial reduction in dross and sludge formation, and a reduction in radiation losses.

The uniform heat distribution has almost eliminated rejects, which formerly amounted to several cans a minute. Electric heat has further reduced the cost of side-seam-soldering the cans by reducing the fuel charges fully 50 per cent. Working conditions are much improved, and the fire hazard has been removed.

Automatic control relieves the operator of any responsibility for maintaining temperature and eliminates the need for adjustment of the heat source. The current to the pot is automatically switched on at 4 o'clock in the morning and is ready for production when the workmen come in at 7 A. M.

The seven new installations have three 5-kw. special through-the-bottom units, Calrod. Because of their special design, these units provide an even better heat distribution throughout the pots than the first installation.

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## Jig for Assembling Radio Transformer Coil Laminations

By C. W. HINMAN

THE drawing herewith presents a design of a device for assembling the laminations in radio transformer coils. In Fig. 1 and 2 are shown the usual forms for the "E" and "I" (magnetic sheet iron) lamination blanks that are used in these coils, and Fig. 3 shows the coil and laminations assembled. The coil **A** is wound with insulated wire around a core which has a rectangular opening **B** of such width that it will fit tongue **C** of the **E** laminations. The side walls of the wound coil are made to fit in the openings **D-D**. The length of the opening **F**, in the coil, is made to accommodate a fixed number of lamination thicknesses when fully assembled as at **G**.

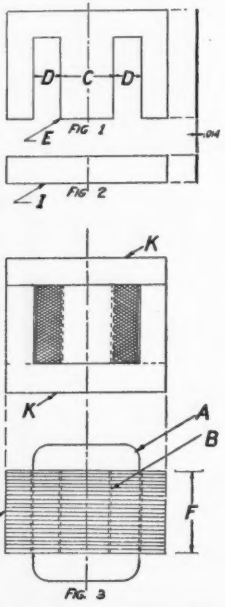


**Fig. 1 and 2—Usual forms for the "E" and "I" lamination blanks for radio transformer coils. Fig. 3—The coil and laminations assembled.**

A suitable hand fixture for rapidly assembling laminations in the coil is shown in Fig. 4. The laminations are stacked in two vertical magazines, **H-H**, which are located on the right and left sides of the fixture and are eight inches high. A flat spring **J** is inserted by hand through the opening in the coil; the coil is then suspended at the center of the fixture, ready to receive the laminations.

The laminations are usually inserted in pairs; that is, two laminations from one magazine, then two from the other until the core opening is full. The **"I's"** are afterwards pushed in between the alternate openings between the **"E's"** at the sides **K-K** by the use of another fixture, not shown.

The fixture is operated by turning the handwheel **L** which is keyed on shaft **M** and which revolves crank **N**. The crank drives the crank-arm **O** which in turn is pivoted at its opposite end to carrier-bar **P**. The carrier-bar drives its mate **Q** through the link-bar **R**. In both carrier bars

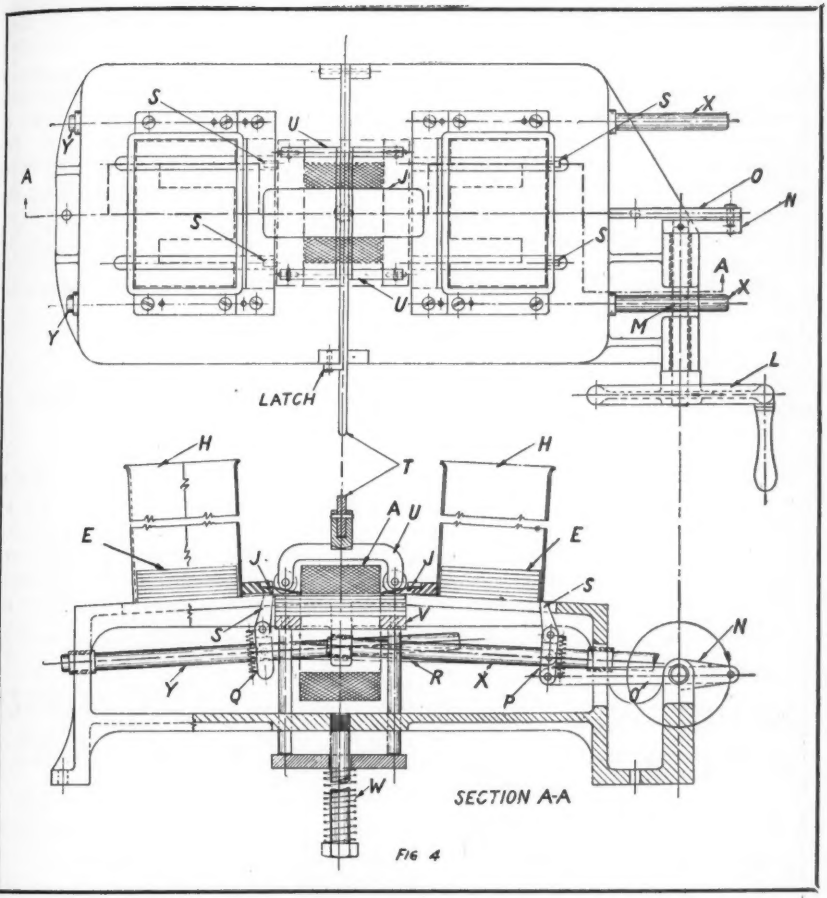


**Fig. 4—Hand fixture for assembling radio transformer coil laminations.**

two jack-knife pawls **S-S** are pivoted and each bar is fastened on two sliding rods **X-X** and **Y-Y**.

After coil **A** is suspended in the fixture the arm **T** is thrown into position and latched as shown and a double compound equalizer **U**, having four depressing rollers and centralized on the arm by a pivot pin, contacts the spring pad **V** which surrounds the coil.

The points of the pawls project sufficiently above the surface of the fixture to remove two "**E**" laminations from underneath the magazine stock and push them forward between the equalizer rollers and pad, and under strip **J**. This operation depresses the spring pad as the central tongue on the lamination enters the coil opening. Revolving the hand wheel, the opposite pair of pawls repeat the operation just described—that of taking two laminations from under the

opposite magazine stack.

The top surfaces of the fixture approaching the work are inclined 3 deg. from the horizontal, thus making it possible for each pair of laminations to enter the coil without jamming or interfering with previously inserted laminations. To compensate for wear under the magazine, hardened plates not shown in the illustration must be provided.

When the coil is fully assembled with laminations, the spring pad is depressed to its lowest point; therefore, when arm T is unlatched and thrown back, the assembled coil is automatically ejected by spring W.

In operating this device it is obvious that two laminations are inserted in the coil at each half turn of the hand wheel or four at each complete revolution. The standard radio transformer coil usually takes about 108 laminations. A revolution counting device is a convenient attachment on a fixture of this kind. With such an attachment, the driving shaft M can be automatically "declutched" and the assembling stopped after the correct number of laminations has been inserted. For obtaining increased output this fixture is sometimes constructed in duplex or even in triplex design but experience has proved that when attempting to assemble more than one or two cells simultaneously assembly troubles usually occur.

## A Simple Tap-Oiling Device

By Robert Lindgren

THE difficulty of lubricating a tap while holding the workpiece with one hand and the feed lever with the other is a familiar problem. In the Norge plant this problem has

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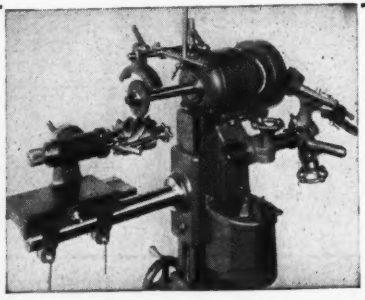

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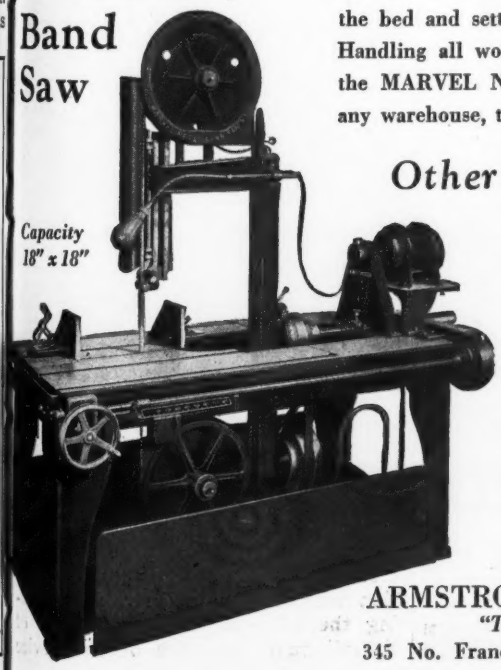

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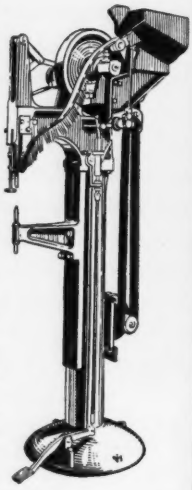

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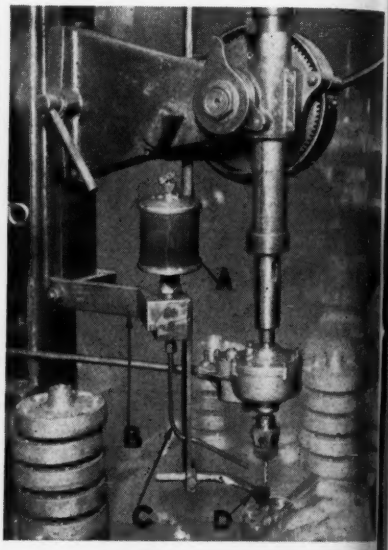
been solved by the use of a device consisting of a sight-feed oiler and a small brush, set up as shown in the illustration.

The sight-feed oil cup A is supported by the bracket B, which is clamped to the vertical column of the drill press. A small piece of copper




Brush and Sight-Feed Oiler Arranged to Supply Oil to a Tap

tubing C connected to the sight-feed oiler conveys the lubricant from the oiler to the brush D, which is also held by the supporting bracket. The brush is so positioned that the tap passes through it as it is fed downward into the work and again as it is raised from the work, being lubricated on the way down and cleaned on the way up.

The amount of oil required to lubricate the particular tapping operation can be regulated merely by turning the adjustment screw on top of the oil cup. The use of the device

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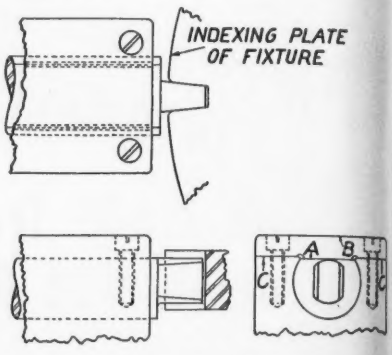
leaves the operator's hands free to hold the work and to apply pressure on the feed lever.

## Simple Indexing Plunger Facilitates Compensation For Wear

By J. E. Fenno

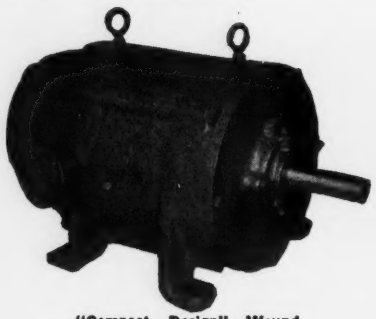
THE accuracy of an indexing fixture or jig depends largely upon the closeness of the sliding fit of the plunger in its bearing. As a rule, the sliding surfaces are hardened, but even with this precaution, continued use results in appreciable wear and a corresponding inaccuracy in indexing.

To quickly compensate for this wear, one concern uses a very simple method of mounting the plunger as indicated in the accompanying illustration. This design is in general use in this plant both for fixtures and jigs. It is far more economical to construct and repair than the ordinary type of plunger.




Drawing Illustrating Method of Compensating for Wear of Indexing Plunger

The plunger, instead of being of the usual round design, is flatted off as indicated at A. The retaining plate B against this flat holds the plunger in



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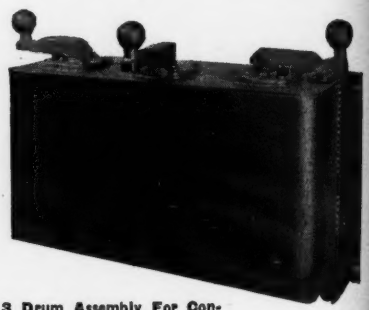

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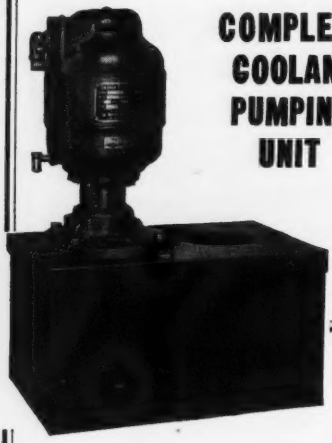

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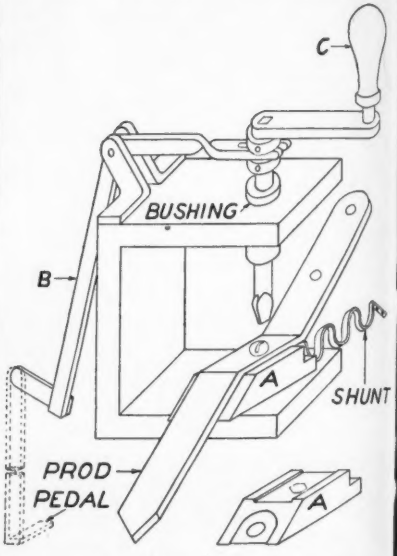
its correct radial position. As the plunger shows signs of wear, enough is ground off the surfaces C on plate B to compensate for the wear.

One important feature of this arrangement is that the curved surface of the plunger retains its full bearing at the bottom and sides even when worn so that when the compensation for wear is made, the fit is practically as perfect as it was originally.

## Battery Tester Assembly Jig

By C. H. WILLEY

AN inexpensive jig which cuts time and cost on small job production is shown in the accompanying illustration. This jig was designed to fasten shunts to the prods of battery testers and consists of a hand and foot operated screw driver.

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a hex nut is placed in the nest of block A. The prod and shunt are located on the base of the jig, and the screw that is to fasten them together is placed directly in line with the hole in the nut. Movement of lever B outward, which is done by means of the pedal, brings the screw driver to bear on the screw. Several turns of crank C are sufficient to tighten the screw and thus fasten the shunt to the prod.

One can readily see the advantages of this device when an electric screw driver is not available. This device can be adapted to a wide variety of assembling operations.

## Height Gage Attachment for Shaper Gage

By C. F. Fitz

IN THE experience of most tool and die makers there have been times when a set-up job or layout could have been expedited with two height gages; however, it is rare for even

Drawing of Height Gage Attachment for Shaper Gage

an expert mechanic to have more than one of these instruments in his kit of tools. To overcome this difficulty, a simple attachment was made to fit the standard shaper and planer gage

shown in the illustration. The attachment can be made of Brown & Sharpe flat tool steel which must be hardened, tempered, and ground to a sharp edge. In use it is attached to the slide by a thumb screw. It can be adjusted to the proper height by merely gaging the distance between the base of the gage and the top of the movable slide. This use of the attachment assures the same accuracy as would be obtained by the use of a vernier height gage.

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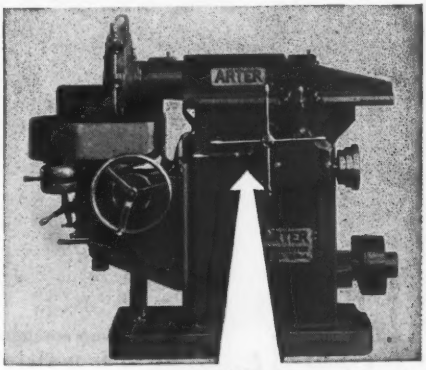

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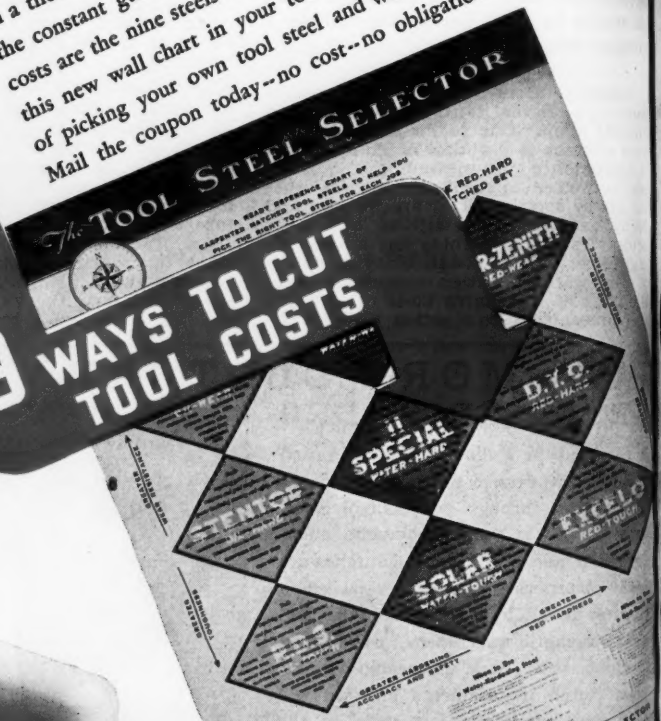


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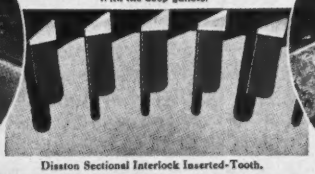
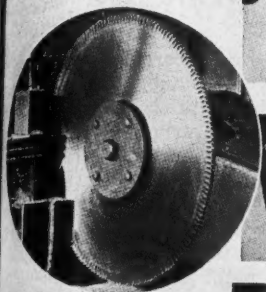


Disston Sectional Interlock Inserted-Tooth.



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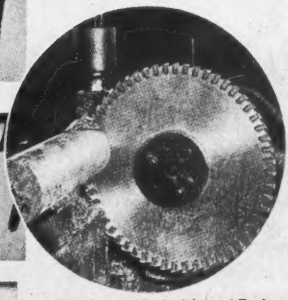

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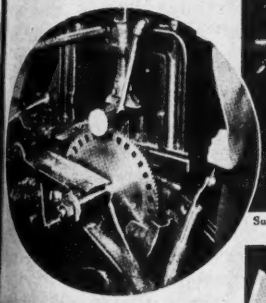

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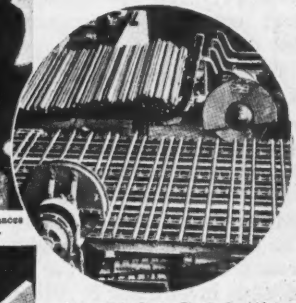

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# Over the Editor's Desk

## *The Metallurgical Engineer*

THE feature article in this issue deals with recent developments in the field of railway transportation, and describes the building of the modern light weight railway passenger coach. These coaches have now been in use on a number of railroads over a period of something more than two years, and have proved their advantage in matters of starting facility, flexibility in operation, braking efficiency, high speeds, and—what is most important — comparatively low cost of operation.

Thus railway transportation equipment has been added to the long list of modern mechanical equipment which owes its high efficiency to the existence of such materials as stainless steel, duralumin, and other light weight metals of high tensile strength. The attention of the public is called, from time to time, to the development of new inventions in the mechanical field or to improvements such as the one described in the article referred to, and we become aware in a general way that these modern inventions and improvements are dependent to some extent upon modern metals. We are made aware of these inventions through advertisements and by means of magazine and newspaper articles and, in many cases, attention is focused upon the high efficiency of materials which has made these inventions possible. No mention is ever made, however, of the men who have spent years in developing these materials.

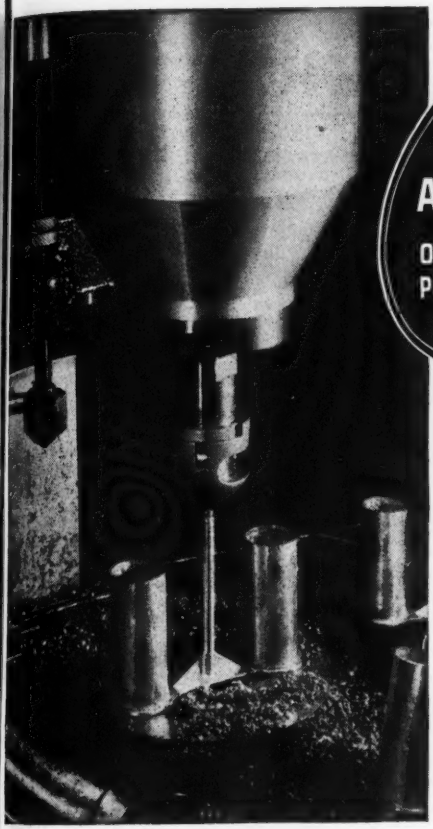
Among those who contribute in one way or another to the progress of civilization, the metallurgical engineer is outstanding. Compare any mechanical unit of today with similar units of a dozen or a score of years ago; automobiles, airplane motors, fans, refrigerating units, typewriters—and note the comparative light weight, symmetry of design and high operating efficiency. Most of these improvements have been made possible through the development of stronger materials — all of which can be credited to the metallurgical engineer.

Yet the metallurgical engineer is quiet and unassuming and for the most part—like other real scientists—is content to produce results and let others have the glory. Only once a year does he come out from behind the test tubes of his laboratory, and that once is to mix with others of his kind and compare notes as to the wonderful things that are being done and which are yet in course of development.

This year the Annual Meeting of the American Society for Metals will be held from October 19 to 23 at the Public Auditorium in Cleveland, Ohio. Concurrently with the convention of the American Society for Metals will be held a National Metal Show, which will comprise an exhibition of materials, heat treating equipment, various kinds and types of metals, and interesting products of all kinds having to do with the working of metals and alloys.

The visitor to this show will find it a visible record of the progress that is being made from year to year in the science of combining selected elements and giving them the correct treatment to produce irons, steels, and other metals that will have the exact amount of strength or toughness or hardness required.

Those who can do so will find it very much worthwhile to attend this convention and exposition.



One of a Series of Case Histories Showing Tough Jobs Made Easy By The Haskins Tapping Method.

# *Threading* AT NEW HIGH SPEED

## ON A HASKINS TAPPER PRODUCTION RECORD *Shattered*

| | |
|---|---|
| Material | Zinc base die casting |
| Size of Thread | ¼"—20 TRIPLE thread |
| Length of Thread | 2⅜" |
| R.P.M. Threading "on" | 550 |
| R.P.M. Threading "off" | 1100 |
| Production | 750 pieces per hour |

**No breakage! No spoiled work! A former day's work done in less than an hour! No clamps or hold-downs. Just a simple slotted base plate. Handling cut to a minimum. A better job in less time with less effort. The reasons: HASKINS foot pedal control, simple fixture and no-float taphead.**

**Only a Haskins has these exclusive features. They will cut costs and increase production in your plant, too. Write for fully illustrated booklet. It's full of facts about tapping and threading. And it's free. R. G. Haskins Company, 4667 West Fulton Street, Chicago.**

**15,000 pieces were threaded before it became necessary to resharpen die.**

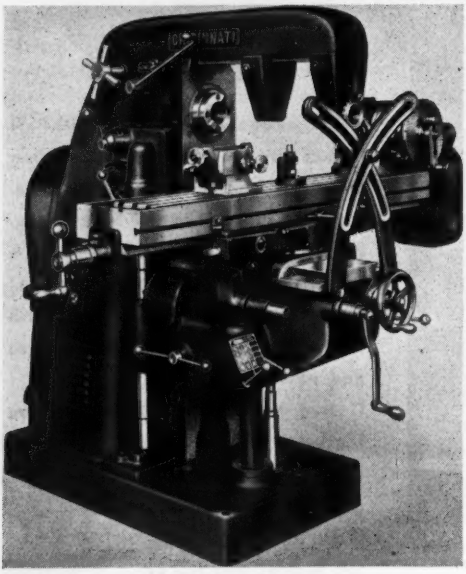
# THE HASKINS METHOD

European Representative—G. E. Marbaix, Ltd., Vincent House, London, S. W. 1

# New Shop Equipment

## Cincinnati No. 2-MH Milling Machine

A milling machine designed to handle a small-to-medium size workpiece, either on tool room or production work, has been brought out by the Cincinnati Milling Machine Company, Cincinnati, Ohio. This machine, to be known as the Cincinnati No. 2-MH, is of the same general design as the Cincinnati L-Type except that it is larger and heavier throughout. The rectangular overarm is provided with a pilot wheel for adjusting it to position, resulting in more convenient and quicker set-ups.



Cincinnati No. 2-MH Milling Machine

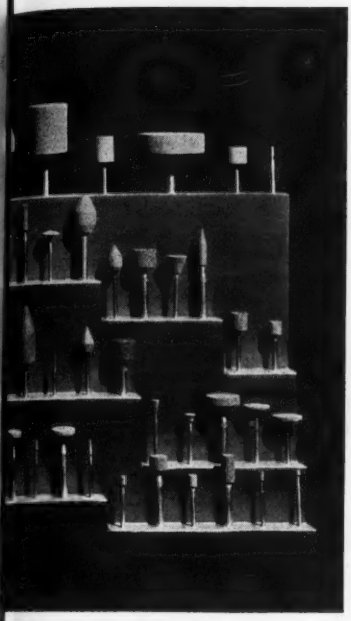
All operating and control levers are conveniently grouped for manipulating the machine with a minimum of physical effort. Many safety features protect both the operator and the machine. All rotating shafts are guarded; hand cranks do not rotate while the power feed is engaged, and the spindle brake stops the cutter immediately as the starting lever is pulled down. Lock pins in the cross and vertical feed levers prevent the wrong lever from being moved; a two-way locking device prevents the spindle reverse lever from accidentally being moved, and a safety gear prevents overloading the machine.

Ranges are 28 in. longitudinal table travel, 10 in. cross travel, and 19 in. and 18 in. vertical travel, respectively, for the plain and universal types. The spindle nose conforms to the Milling Machine Manufacturer's Standard No. 50. Fifteen spindle speeds are available ranging from 23 to 1200 r.p.m. and are obtained by shifting two quick acting and easily moved levers. The spindle reverse lever also operates the motor starting switch and therefore controls the starting and stopping of the motor. The 5 h.p. motor is enclosed in the column and is conveniently accessible by opening the large cover at the rear.

Twelve feeds are available, selected quickly from the normal operating position by two levers at the left hand side of the knee. The standard longitudinal feed range is ¾ to 30 in. a minute. Power feeds for the cross and vertical travels are also included. The table feed engaging lever is directional controlled. All feeds are reversible from the front and rear through the reverse lever on the side of the feed box. Power rapid traverse in six directions is obtained by a lever on the right hand side of the knee.

All speed and feed changes are effected through sliding gears on integral three-key shafts. The entire spindle drive is mounted on anti-friction bearings, the spindle itself being mounted on double rows of anti-friction bearings, front and rear, with a self-compensating rear bearing. Lubrication is automatic for the parts within the column, and hand operated pressure oil-shot for the table, saddle and knee.

A cutter coolant pump of eight gallons capacity is included in the standard equipment of each machine. Universal machines are equipped with a 10-in. universal dividing head and a



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## MOUNTED POINTS AND MOUNTED WHEELS

## oom Work

2. Fast cutting 38 Alundum abrasive for steels and steel alloys
3. Crystolon abrasive for cast iron and non-ferrous metals
4. Nickel plated, tempered steel spindles
5. **Norton Points don't come off the spindle**

W-559

RASIVES

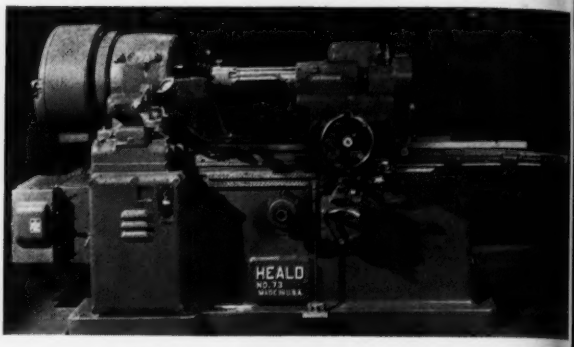
A catalogue showing the complete line of Norton Mounted Points and Wheels will be sent on request.

totally enclosed driving mechanism for milling helixes ranging from 2½ in. to 100 in. lead. If shorter leads are desired, an auxiliary reducing gear bracket can be supplied, producing leads of ¼ in. to 100 inches.

Net weights are as follows: No. 2-MH Plain, 4000 lbs.; No. 2-MH Universal, 4,400 pounds.

## Heald No. 73 Airplane Cylinder Grinder

In order to make possible the production of an exceptionally fine finish under commercial conditions on aircraft cylinder engines, Heald Machine Company, Worcester, Mass., has redesigned the Heald No. 73 Airplane Cylinder Grinder. The new design incorporates many features which make this machine particularly desirable. As in the older design, the heads are readily inserted into the hollow work head spindle and are held in such manner that the head is at right angles to the attaching flange and concentric with the outside diameter of the skirt; thus the cylinder is ground in exactly the same position in which it is held when finally assembled. Holding the cylinders rigidly in this manner with no overhang, makes possible the rapid removal of stock to the manufacturer's limit of accuracy and permits the obtaining of an excellent finish in a




Heald No. 73 Airplane Cylinder Grinder

*Nibble the Costs*

**With a multiple purpose**

**SAVAGE NIBBLING MACHINE**

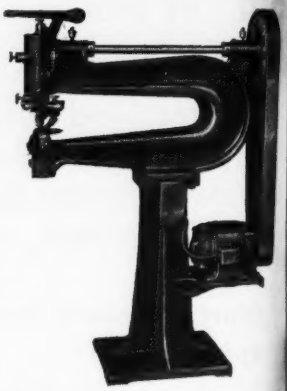
**Hours the ordinary way**

**vs.**

**Minutes with a Savage Nibbler**

**For cutting shapes and duplicate parts to a scribed line or by guide template. Will cut chrome-nickel sheets and other tough alloys.**

**No Distortion — No Oxidation**
**No Secondary Operations**



**Capacities to 7/8"—Throat depths to 36".** **No. 130—1/8" capacity.**

PIONEER MANUFACTURERS OF NIBBLING MACHINES

**W. J. SAVAGE COMPANY**

**KNOXVILLE** SINCE 1885 **TENNESSEE**

# ALLOY STEELS

Extreme hardness for the jaws, spring temper for the body, minimum distortion throughout . . . all these requirements of steel for spring collets are met in a greater measure by an oil-hardening alloy grade of HY-TEN specially developed for this purpose.

## Standard S. A. E. Steels in Stock

rite for free copy of Steel er's Data Sheets, con- ining valuable informa- on on use and treatment steel.

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minimum of time.

The base of the machine is a T-shaped casting weighing approximately 5000 lbs. which provides a completely enclosed oil reservoir in the lower part. The ways of the base are pressure lubricated, insuring a constant, definite film for the table to ride upon. All push button motor controls, together with the electric switches and connections, are centralized and contained in one terminal box built into the front of the base, while the work head speed control rheostat is located just to the right of the push button station.

The main table has been made considerably heavier and, as before, reciprocates hydraulically on a flat and a V way which are fully guarded. The table is reciprocated by oil under constant pressure and the hydraulic mechanism permits the operator to have complete control of the speeds and direction of movement at all times. Table speeds are controlled by a throttle at the front of the machine and can be varied from zero to 20 ft. per minute. The workhead speed may be varied to any speed within the range of 690 to 2070 r.p.m.

The workhead carries a hollow spindle mounted in a specially designed shoe type plain bearing. Full pressure feed lubrication is provided with adequate sealing to exclude from the bearings all water, dust and foreign substances. The hole in the spindle is approximately 10-in. diameter, which is ample for any standard airplane cylinder. The drive for the workhead is by multiple V belts from a d.c. variable speed motor mounted at the rear of the base.

The wheelhead is driven direct by a flexible coupling from a jackshaft bolted to the wheelhead motor which completely eliminates all possibility of chatter in the workhead which might be caused by belt pulsation when using a direct belt drive. The wheelhead and jackshaft are dovetailed in line on the cross slide while the wheelhead motor is belted to a sub-base keyed to the cross slide with a screw for belt tension.

The machine is fully motor driven with an individual motor for the wheelhead, workhead and the oil and coolant pumps. The workhead and pump motors are mounted on vibration dampeners, thus removing any vibration that might come from these units.

A dial indicator enables the operator to constantly follow a change of size by direct readings. The indicator not only gives finish size, but also enables the operator to true the wheel at a predetermined point before the finish size is reached.


# NOT ONLY FASTER . . . . but EASIER

You can cut hours—not minutes—from your grinding time when you use an Onsrud 50,000 R.P.M. Grinder. Its ¼ H.P. will take deep, tough cuts when you need them—or you can just skim over the surface, because it is so light and easy to handle. Best of all, it has no vibration, and can not heat up or burn out by stalling in a cut. If you want to use the Onsrud Grinder as a stationary tool, you can mount it in a vise or fixture. In any position, it runs with the same cool, dependable operation. If you need a better high speed grinder, write for a Free Circular without obligation.

Mounted in Vise for Stationary Use

Leading Plants are Equipping with this Grinder

50,000 R.P.M. TURBINE GRINDER

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On every page are listed products that will save you time, trouble and money in all production and maintenance operations where bearings are involved.

• COMPLETELY Machined and Finished Bronze Bearings in over 600 sizes ready for assembly into any usual application from ¼"x⅜" x1¼" to 4"x4½"x7". Available instantly from stock at any time and in any quantity.

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• Anti-Friction Metal and Genuine offering superior qualities never before known to Babbitt.

• Absolutely unequalled control and precision in foundry processes assure the very maximum of desirable physical characteristics in all Bunting products. Write for catalog or ask the Bunting mill supply wholesaler in your market. The Bunting Brass & Bronze Company, Toledo, Ohio. Branches and Warehouses in All Principal Cities.

**BUNTING** Bearing **Quality**

**BRONZE BUSHINGS • BEARINGS**

**MACHINED AND CENTERED BRONZE BARS**

**ANTI-FRICTION METAL**

RHOADS
TANNATE
LEATHER
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NO WORRY—
MORE DOLLARS

In an iron working plant an 8-inch 2-ply Tannate Leather Belt has been giving splendid service on a 60-inch heavy duty lathe for more than twelve years. A report says, "Aside from a few surface cracks the belt is in good condition, and should give more years of service."

The belt requires practically no attention. The superintendent mentioned that the motor had not been moved back to take up stretch more than two inches during the past two years.

The satisfaction and freedom from worry that such long, smooth-running service gives may not be counted in dollars. But the savings in maintenance and replacement costs, and the greater production can add very materially to your cash profits.

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Factory, Wilmington, Del.

## Fellows Enveloping Gear Generator

The Fellows Gear Shaper Company, Springfield, Vt., has brought out a new machine which is used with a new type of tool for finishing spur and helical internal and external gears. The principle employed on this machine differs from the well-known gear shaper method in several respects; the tools used, shown in Fig. 2, are made without any

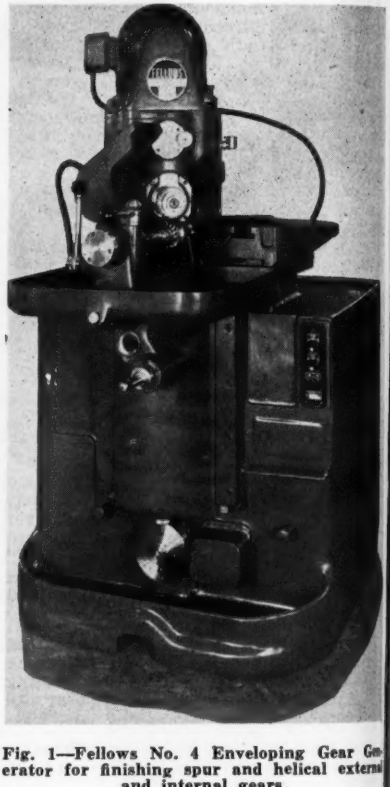


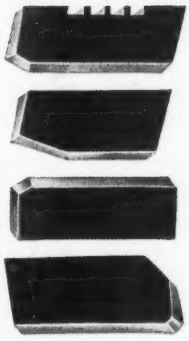
Fig. 1—Fellows No. 4 Enveloping Gear Generator for finishing spur and helical external and internal gears.

outside angle or side clearance to the teeth, and instead of being geared in harmony with the work, drive the work. The enveloping generating tool is kept in intimate contact with the work at the same time as it is being rotated at high speed accompanied by a comparatively slow reciprocating movement.

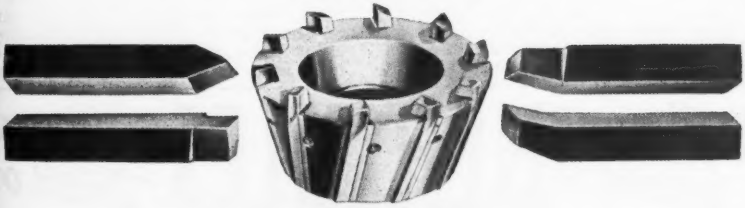
The enveloping generating tool employed in this process embodies teeth that are conjugate to the teeth on the

# "CROBALT"

**CROBALT** is not experimental. Developed and applied experimentally in production as early as 1924, it has during the past two years been manufactur' ! and sold commercially a Detroit and has successfully proven itself in large scale production in a wide variety of applications.

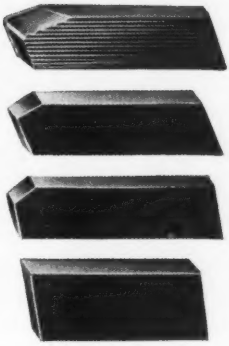


**CROBALT** is available in the form of both standard and special tools. Its low cost permits the use of solid tools instead of costly tipped types, particularly in the smaller sizes. For forming, **CROBALT**'s high production per grind makes it an ideal cutting metal.



## TURNING and FORMING

For such operations as turning, facing, and forming, etc., **CROBALT** possesses the definite proven advantage of longer tool life per grind—UNAFFECTED by the increased cutting speeds permissible with CROBALT.



## STRADDLE and FACE MILLING

**CROBALT**'s proven 20 per cent longer life (average) per grind as compared with competitive cutting metals has created for it a real place in the milling cutter field.

# MICHIGAN TOOL COMPANY

**7171 East McNichols Road** **Detroit, Michigan**

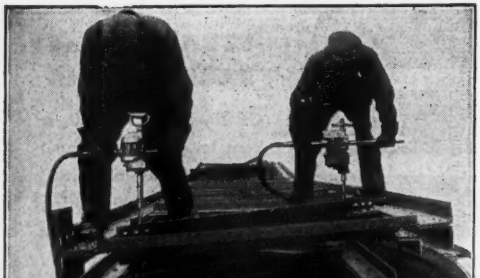
work, but so related that the teeth on the tool and the work mesh only when the axes are placed askew to one another. The cutting edges on the tool intersect the faces of the teeth and extend in planes that are transverse to the axes. Thus when the tool and work are brought into intimate contact and rotated under pressure, the divergent paths through which the teeth travel cause the cutting edges to move lengthwise and remove material by a shearing action. The surfaces of the teeth back of the cutting edges also contact the work under pressure and effect a burnishing action which produces a smooth surface on the contacting surfaces of the gear teeth.

This burnishing action is effected by making the sides of the teeth on the tool bowed, so that contact between the tool and the work takes place over substantially the entire length of the engaging surfaces. For an external gear, the teeth on the tool are bowed inward, whereas for an internal gear, the teeth on the gear are bowed outward because an internal gear is the reverse of an external gear. The cutting faces of the two members of the tool are slightly separated from one another, the width of this space and the degree of curvature being important as they govern the amount of material removed at each traverse cycle of the tool as well as the resultant finish on the work.

The outstanding virtues of this process for finishing gears are simplicity of design, ease of sharpening, and high production. The tool is simple in design and comprises only the two cutting and two burnishing members, a spacing collar, and a holder upon which the members are retained. Sharpening is easily accomplished, and the method of sharpening is governed by the degree of angularity necessary between the work and the tool.

Owing to the manner in which the tool is applied to the work, it is possible to operate it at high rotative speeds without detriment to the tool either from the standpoint of cutting or of burnishing. Speeds as high as 1000 surface feet per minute can be employed and an excellent finish is produced as the tool can be fed slowly back and forth across the gear. The teeth of the gear can be reduced in thickness approximately 0.002 in. per traverse cycle and if the gear is roughed to commercial limits, one complete traverse cycle is, in most cases, sufficient. As an example of the high production possibilities, an eight pitch gear of two in. pitch diameter and one in. face width, can be


You'll never know a HERCULES until you've tried one



"Put a Hercules on the job and get it done" is a familiar phrase in many modern shops where they have learned to know HERCULES Portable Tools. But YOU will never know a HERCULES until you've tried one. So make it a point to get acquainted NOW . . .

There are HERCULES engineers in branch offices in all principal centers. Let them counsel with you regarding the use of HERCULES Portable Tools in YOUR business. They can help you—prove it right in your own shop. Asking for this service incurs no obligation.

A complete line of Grinders, Sanders, Polishers, Drills, Nut Runners and Screwdrivers in High Frequency Electric and Pneumatic portable types.

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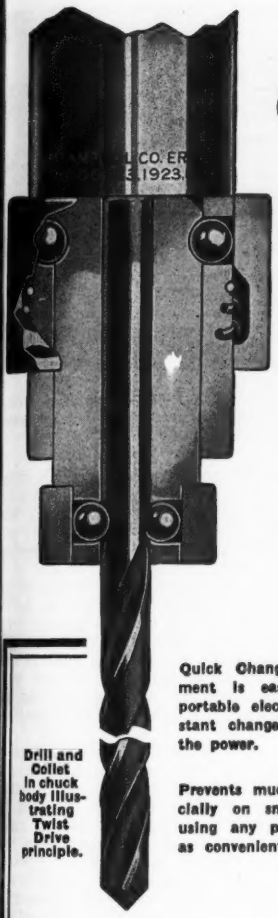
# TITAN

# *Twist Drive*

## revolutionizes

# QUICK CHANGE EQUIPMENT



**At last a positive drive for straight shank drills that greatly increases the many advantages of quick change equipment.**

**Spring Tension Chuck Ring**

**An exclusive feature of the TITAN Quick Change Chuck. The spring confined in the ring keeps it in place over the driving balls, locking the collet in position for positive drive at any angle.**

**Twist Drive On Flutes Of Drill**

**Two hardened steel balls in the collet drive against the flutes of the drill, eliminating slippage and scored shanks.**

**Use Any Standard Straight Shank Drills**

**Save the high costs of special and taper shank drills and the time required to prepare them for other drives.**

**Drill and Collet in chuck body illustrating Twist Drive principle.**

**Quick Change Twist Drive Equipment is easily installed on any portable electric or air drill. Instant changes without shutting off the power.**

**Prevents much drill breakage especially on smaller drills. Permits using any part of a broken drill as conveniently as a new one.**

**Chuck your drills as simply as this.**

**Portable electric or air drill application.**

**When ordering No. 10 TITAN Quick Change Chuck and Twist Drive Collets for portable or electric tools, please specify name and make of the tool and number of jaw chuck now in use.**

## TITAN TOOL CO.

**FAIRVIEW, PA.**

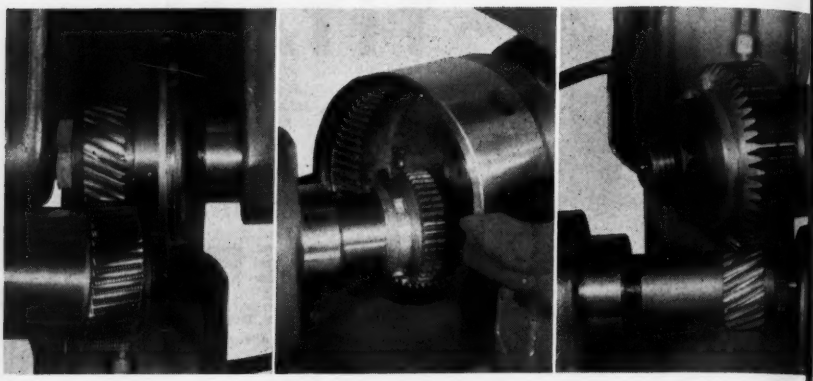
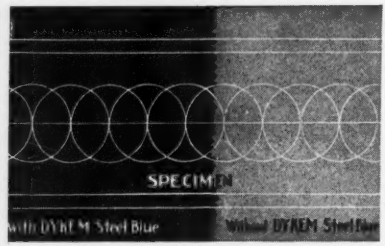


**Fig. 2—Spur and helical gear enveloping generating tools. Fig. 3—Close view showing envelo ing generating tool finishing a helical pinion. Fig. 4—Close view showing enveloping generatin tool finishing an internal helical gear.**

finished to a high degree of accuracy in 25 seconds.

The design of the enveloping generating tool is governed by the shape and character of the work. For instance, the tool used for generating a spur gear is made with helical teeth so that the axes of the work and tool, when in operation, can be set askew to each othe This is shown in Fig. 2. On the othe hand, the tool used for generating hel cal gears is made with spur teeth to pro vide for the necessary angular settin These are cases, however, where it necessary to compromise because of th nature of the work and, for a helic gear, the tool is made with helical tee of a lesser angle than that on the ge it is intended to cut. The tool is the set at angle with relation to the wor this angular setting making up the di ference between angles on the tool an work.

Figures 3, 4, and 5 show applicatio of this type of tool to the generating an external helical pinion, an interna helical gear, and a helical gear of th shoulder variety. Fig. 5 shows a diffe ent type of enveloping generating too which is necessary because of the fa that the tool cannot be reciprocate without interfering with the projectin shoulder on the work. For work of th character, the enveloping generati tool is made in one piece and envelo the full face width of the gear. T cutting edges are obtained by providi the tool with a series of slots cut to t full depth of the teeth and located in helical path normal to the helix of th teeth on the tool. These slots are spac fairly close together to present the ma imum number of cutting edges. Whi the principle of cutting and burnishi is somewhat similar, this tool need n be reciprocated although a slight amou of reciprocation is beneficial in that reduces the pressure required. T type of tool is, of course, only employ where it is impossible, because of t

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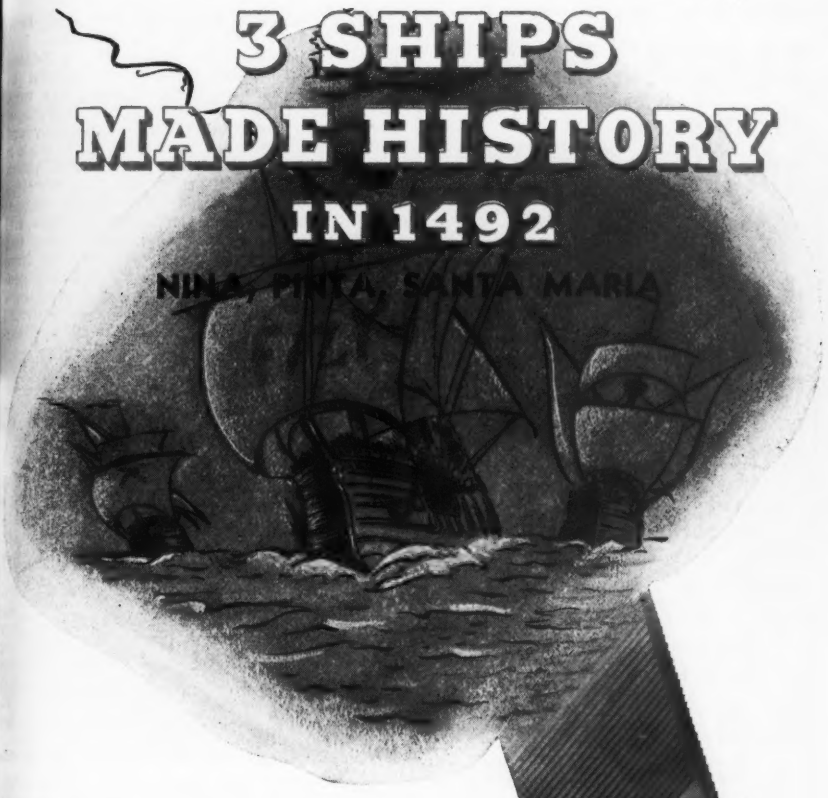
# 3 SHIPS MADE HISTORY IN 1492




## 3 FILES ARE MAKING HISTORY IN 1936

All through history, before and since Columbus discovered a new world with 3 ships in his fleet, the number 3 has stood for success again and again.

Today, 3 file brands are making history throughout industrial plants with their ability to remove stock faster and reduce filing costs.

Interestingly enough, these 3 brands are stamped on files with up to 3 times as many cutting edges per square inch — on files that mechanics say last 3 times as long as ordinary files.

These three brands—Nicholson, Black Diamond and McCaffrey — are now available through mill supply dealers everywhere. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE

**SANDING DRUMS**

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**SEND FOR NEW BULLETIN**

Improved Expanding Rubber Drums . . . accurately balanced . . . precision built. Several types for use with different styles of spindles.

Sleeves of new lapless construction . . . last longer . . . do not ravel . . . can be run in either direction.

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HASKINS Equipment is *Standard* Equipment in Hundreds of Industrial Plants.

Countershaft Type of Equipment

nature of the work, to use the two-section tool previously described.

In the front view of the No. 4 Fellows Enveloping Gear Generator, shown in Fig. 1, it will be noticed that the work is retained in a fixture the nature of which is governed by the character and shape of the work. Usually the work is located on ball bearing centers which permit its free rotation by the enveloping generating tool. The work is elevated and lowered to bring it into and out of contact with the enveloping tool by means of a cam located at the front of the machine and the enveloping generating tool spindle is reciprocated by a crank motion. The machine is provided with complete electrical control and em-

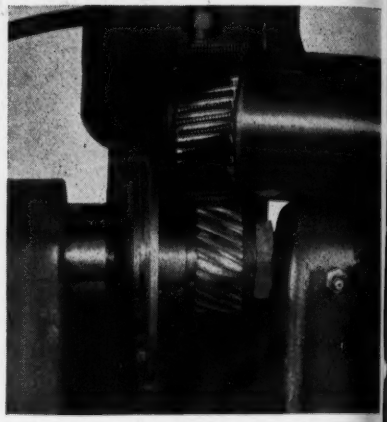

**Fig. 5—Close view showing type of envelopin generating tool used for finishing a helic shoulder gear.**

ploys two motors, one to rotate the enveloping generating tool spindle through change gearing and the other to operate the crank mechanism, elevating cam and so on.

The slide is reciprocated slightly more than the face width of the gear so that the cutting edges of the two members of the tool are brought clear of contact with the work at each end of the stroke. The depth feed is accomplished at both ends of the stroke, and the direction of rotation of the tool spindle is also reversed at each end of the stroke. This procedure applies only to the two-section type of tool. Where the single unit tool is employed, the tool is reciprocated only approximately 1/16 in. and the mechanism is arranged so that the spindle is reversed at every half-revolution of the crank-head instead of at the end of the stroke.

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The complete electrical control equipment is mounted on a terminal board in the base of the machine and is completely enclosed by a hinged cover. The operating mechanism and electrical equipment are accessible through two doors which, when opened, operate a safety switch.

The machine is made in two sizes, one designated as No. 4 with a maximum capacity for gears up to 5 in. pitch diameter, 1¾ in. face width, 7 diametral pitch, and a maximum helix angle of 45 deg. The other is designated as No. 8 with a maximum capacity up to 8 in. pitch diameter, 2½ in. face width, 4 diametral pitch and a maximum helix angle of 45 degrees.

## Pratt & Whitney 10x20-In. Bench Lathe

Pratt & Whitney Division of Niles-Bement-Pond Company, Hartford, Conn., announces a 10x20-in. bench lathe, the design of which incorporates a New Departure Transitorq drive. The machine is intended for tool room work of a fine precision nature and is heavy enough to retain its accuracy under severe use. The bed length is 44 in. with a 10-in. swing over the bed, 6½-in. swing over the cross slide and a maximum center distance of 20 in. The bed and pan are cast in one piece with a cored hole through the headstock leg to admit the driving belts.

The headstock is of heavy design and carries a spindle 1-15/16 in. in diameter. The hole through the spindle is 1-5/16 in. in diameter, providing for a 1-in. collet capacity. The headstock spindle is hardened, tempered and accurately ground, with the front end extremely hard to prevent the embedding of chips and to insure permanent accuracy. The spindle is mounted in super-precision ball-bearings, preloaded to 75 lbs. The headstock spindle bearings are packed in special grease and are permanently sealed.

Mounted on the headstock spindle, in addition to the belt sheave, is a drum used for stopping the spindle by hand or for revolving the spindle for inspecting work. The drum contains four holes for engaging the lock pin for locking the spindle when tightening collets. The spring arrangement of the lock pin is such that the pin will slip out of engagement when the collet has been tightened, thereby eliminating the possibility of starting the lathe with the lock pin in position.

The collet drawback sleeve is provided

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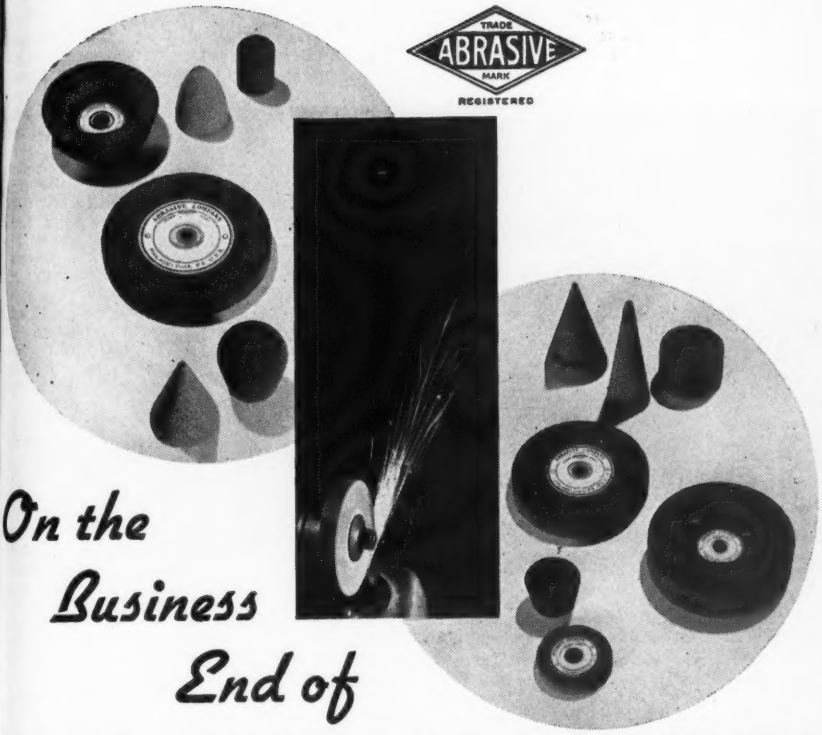


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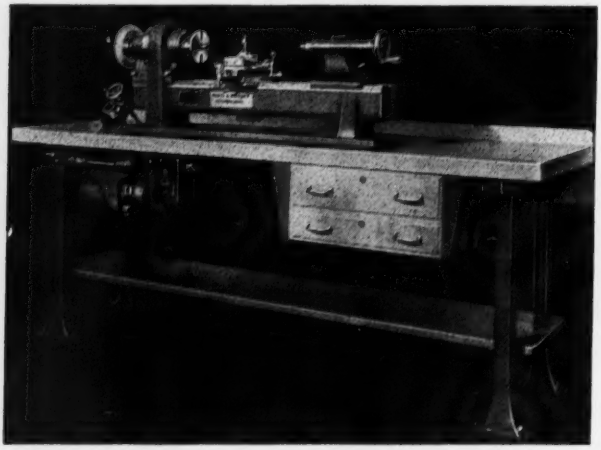
with a ball bearing solely for taking the thrust when tightening work in the larger collets. This is much superior to the plain thrust often used and permits the clamping and unclamping of the work in the collets to be accomplished with ease.



Pratt & Whitney 10x20-In. Bench Lathe

As previously stated, the lathe is driven by a New Departure Transitorq Type DT-¼, equipped with a ½ h.p., 1800 r.p.m. motor. This equipment produces spindle speeds ranging from 200 to 2000 r.p.m. Power is transmitted from the Transitorq to the headstock spindle through four V-belts. Belts can be changed without removing the headstock spindle. The Transitorq is hung from a platform bolted to the underside of the bench, the platform being trunnion mounted at one end, with an adjusting bolt at the other end for maintaining proper belt tension.

The tailstock is also of heavy design. The tailstock spindle is 1⅛ in. in diameter and is provided with a No. 2 Morse standard tapper hole for holding centers, drill chucks, and so on, in the conventional manner. It has also been provided with a tang driving and drift slot so that twist drills can be used to good advantage with safety, as they cannot turn in the taper hole. Graduations on the top of the spindle add convenience in drilling holes to predetermined depths.

The compound spindle rest is of entirely new design, and is provided with longitudinal and transverse slides for accurate turning and boring operations, each slide having travel of 5 in. Each screw is provided with a micrometer dial graduated in thousandths of an inch. The longitudinal slide is mounted on a swivel base graduated through 60 deg. each side of the center and equipped with a vernier graduated to five minutes for accurate setting.

The approximate net weight of the lathe is 3500 lbs. It is available separate or mounted on a suitable bench, several styles of which are available to suit individual needs. Round collets are available in fractional sizes varying by sixteenths, or in decimal sizes. Square and hexagonal collets are also available as are also a 9-in. face plate with tapped holes and a 6-in. three-jaw combination chuck.

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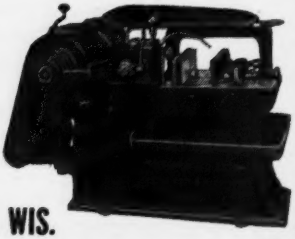

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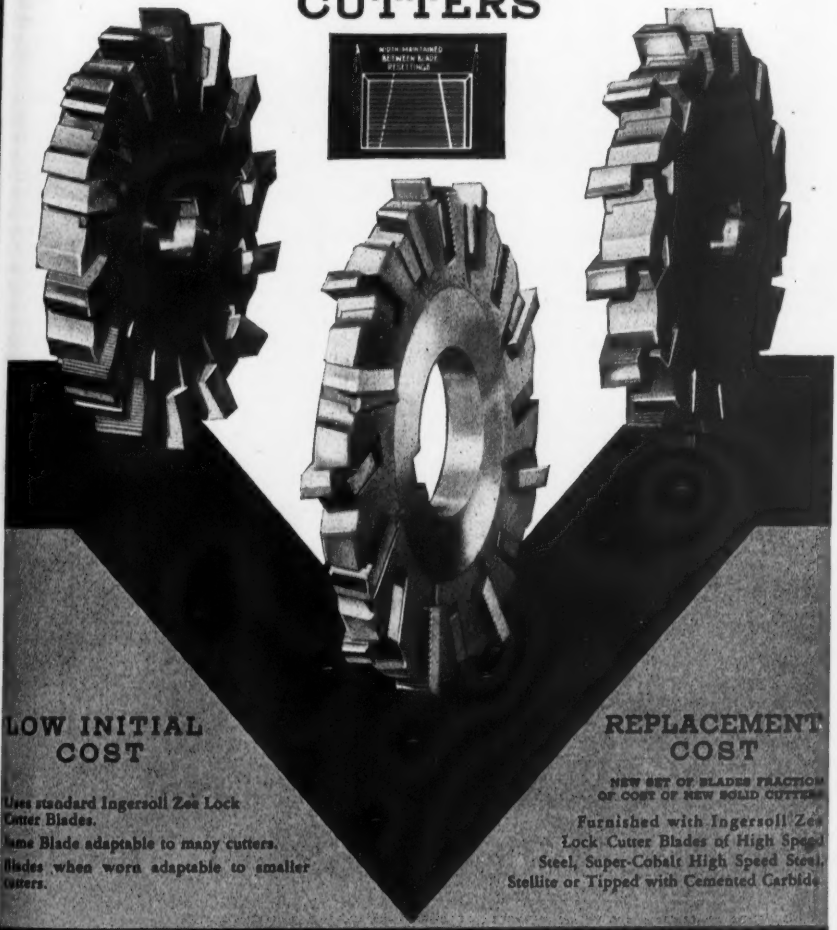
## *Side Milling*

## CUTTERS





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## "American" Broaching Machines

The line of broaching machines made by the American Broach & Machine Co., Ann Arbor, Mich., has been augmented by the addition of three broaching machines and a hydraulic press, all of which are illustrated herewith.

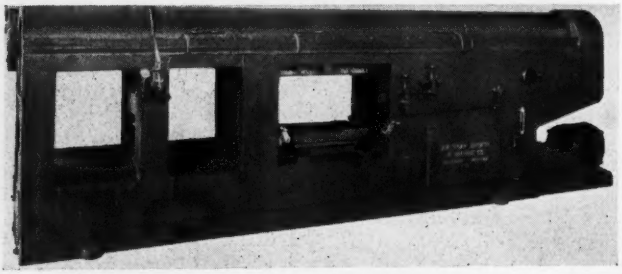

Fig. 1—American Horizontal Broaching Machine

The illustration Fig. 1 shows a horizontal type machine designed for surface broaching of lock seats for crankshaft bearing caps in cylinder blocks. The machine is of box-type construction, with heavy side walls and carefully placed ribs. The hydraulic cylinder is integral with the sliding member, thus providing a massive support for the broach and a flywheel effect which promotes smooth cutting action. This construction permits placing the slides above the cut where they are free from dust and chips, and results in accurate alignment with longer bearing life as compared with other methods.

The machine is self-contained, the hydraulic unit being submerged in oil and thus insuring positive lubrication, reduction of necessary connections to the absolute minimum, and providing complete protection against the entrance of abrasive substances. Although the possibility is remote, if any leakage should occur in the hydraulic system, the oil would drain back into the reservoir inside of the machine.

The fixture is carried on a table or elevator which is actuated hydraulically by the same unit which provides power

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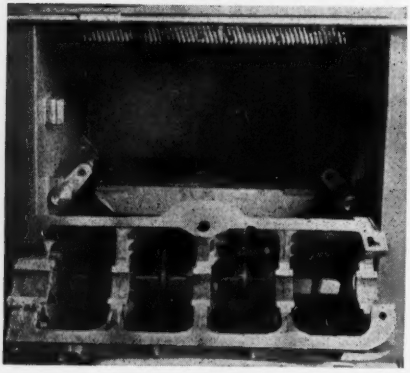


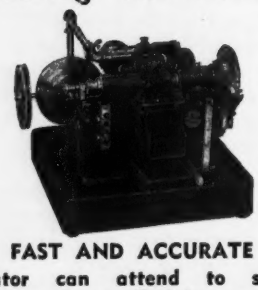
Fig. 2—Close view of hydraulic elevating table of machine shown in Fig. 1, with broaching tool in position and workpiece in the foreground.

for the broaching slide. In its lower position the fixture is at a height suitable to receive the cylinder blocks arriving from the shop conveyor system. The machine operator moves a cylinder block into position, then shifts a lever which causes hydraulic pressure to raise the block and automatically clamp it securely against hardened rest plates and dowel pins which fit into reamed holes for accurate location of the work. A second lever, interlocked with the clamping, now starts the automatic operating cycle of the machine in which broaches approach the work rapidly, then slow down for broaching, after which the work is released and the fixture lowered so that the operator can change workpieces while the broaches are returning to starting position.

The illustration Fig. 2 is a close view in which a workpiece is shown in the foreground with the hydraulic elevating table in the rear and a broaching tool above. The machine illustrated is occupied continuously on the operation mentioned above, but it can be used for any other similar surface broaching operations at any time merely by providing suitable work holding devices and broaching tools.

A 15-ton vertical broaching machine for finishing the bore in type metal

"Waltham" Pinion Cutting Machines



FAST AND ACCURATE

Operator can attend to several machines. For small pinions, a magazine feed not shown in the cut allows the machine to run without stopping, materially increasing the production. One, two, or three cuts, according to the nature of the work, may be made.

WALTHAM MACHINE WORKS
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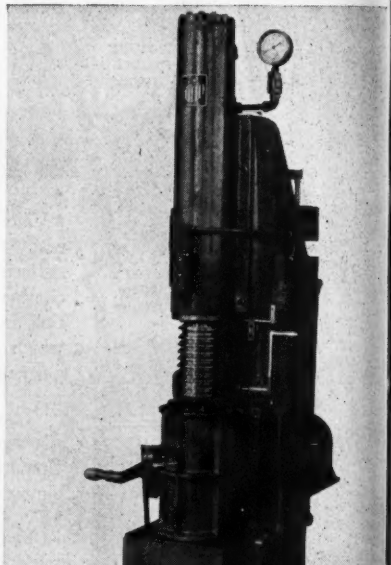

Fig. 3—American 15-Ton Vertical Broaching Machine

total stroke of 24 in. Cylinder diameter of approximately 6 in. is shown in Fig. 3. The ram of the press has a slideway which causes the broach to travel downward in a straight line accurately with reference to a clearance groove in the workpiece. Otherwise the machine is similar to other American Broaching Machines with the same features, such as heavy box column, self-contained hydraulic unit with minimum connections, hydraulic cylinder integral with broaching slides, and so on. A drawer in the base of the machine catches chips, keeps the floor clean in the vicinity and facilitates chip handling. The

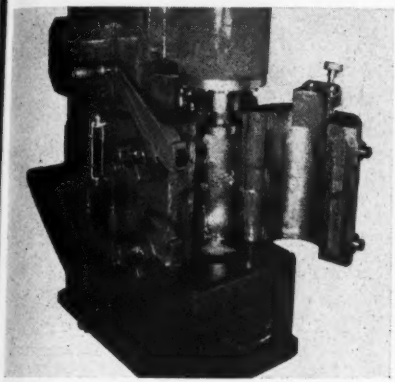

**Fig. 4—Close view of American 15-Ton Broaching Machine showing work-holding fixture open and broaching tools removed.**

last section of the broach for this work has a slight burnishing action so that the cutting teeth of the broach do not drag over the finished surfaces on the return stroke of the ram.

The illustration Fig. 4 is a close view of this machine showing the work-holding fixture open and the broaching tools removed. It will be noted that the front half of the fixture is hinged on one side, with a powerful quick acting double cam lock on the other side. At the top of the front half of the fixture will be seen an adjustable block for retaining mats of different lengths in position securely during the broaching operation.

A 50-ton American Straightening Press is shown in Fig. 5. This machine is of heavy construction and is equipped with a 6-in. diameter ram with downward rapid travel of 104 in. a minute, power pressure stroke of 23 in. a minute, rapid return of 142 in. a minute, and


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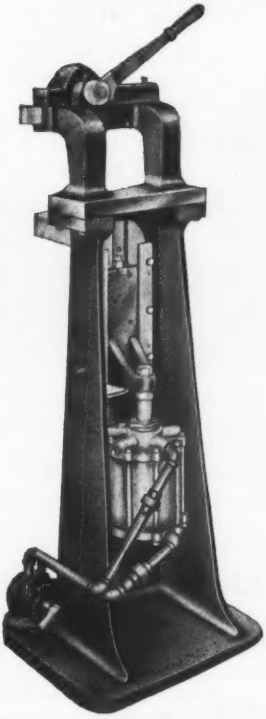

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total stroke of 24 in. Cylinder diameter is 11½ in., table surface, 36x18 in., height of table from floor, 32 in., and approximate weight, 11,000 lbs. A 7½ h.p., 1200 r.p.m. motor is recommended.

The two-stage hydraulic unit is submerged in oil, arranged for direct connection to the driving motor through a flexible coupling supplied with the machine. Pressure variation is controlled by a pedal, thus leaving both of the operator's hands free to manipulate work in process. When the pedal is released entirely, the ram returns to its upmost position.

The illustration Fig. 6 shows an American V-58 Semi-Automatic Broaching Machine which has a normal work capacity of 50 tons and maximum capacity of 56 tons. In general, this machine is supplied for pulling broaches upward, although it can be arranged to pull the broaches downward if necessary. The machine is of massive construction with a column in one piece and adjustable hardened and ground

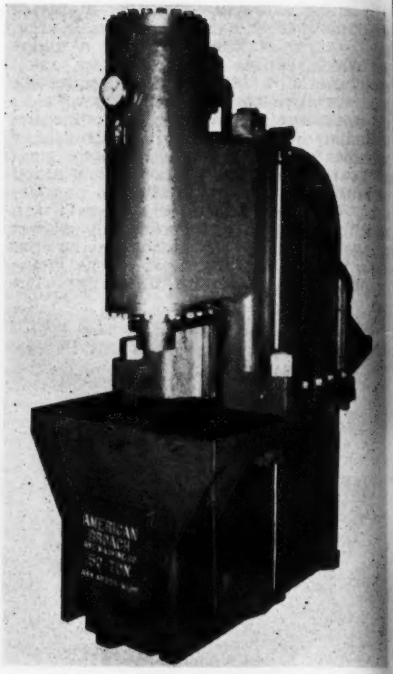

Fig. 5—American 50-Ton Straightening Press

● 11¼ in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1 1/16 in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

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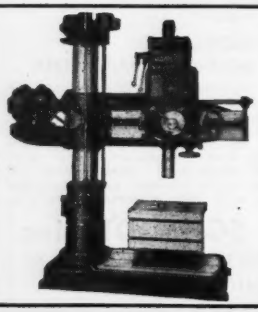

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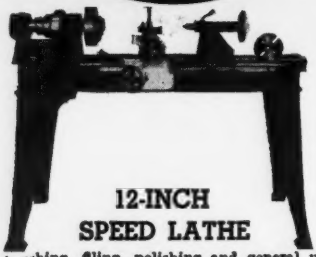

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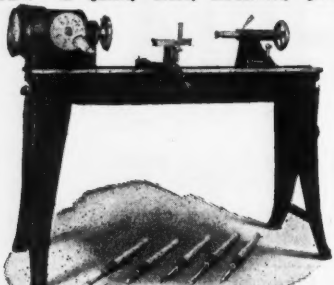

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OLIVER MACHINERY COMPANY
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wear plates and gibs. The slide that carries the cross head for pulling the broach is integral with the hydraulic cylinder—a feature which adds to the rigidity, smooth performance and life of the machine. A flexible coupling is provided for direct motor drive, together with hydraulic equipment capable of operating up to 1000 lbs. per square inch, a large coolant pump, convenient

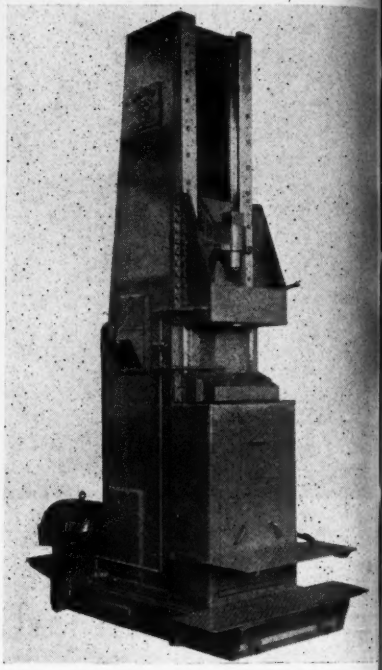


Fig. 6—American V-58 Semi-Automatic Broaching Machine

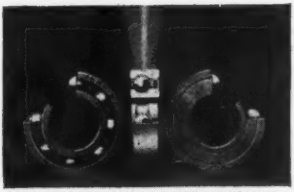
chip pan, and 100-gallon oil reservoir in the base of the column. Direct reading pressure gages, conveniently located operating levers, and other features which simplify operations at high speeds are also provided.

An outstanding feature of this machine is the mechanism which raises the broach automatically connects it to the pulling head, returns it to starting position after the broaching is completed and releases the broach automatically. As soon as the broaching is complete the workpiece drops into an angular chute and is discharged at the right

## . . . against power loss and wear

The extreme, uniform hardness that contributes so greatly to the long life of Fafnir Ball Bearings is achieved by automatically controlled heating and oil quenching carried to refinements far beyond "standard practice." Like many other steps in the manufacture of these bearings the extra care taken proves its worth many months after the bearings have been installed. With Fafnir, extreme accuracy and long life are inherent qualities directly attributable to meticulous attention to detail.

Although all Fafnir Bearings are built to the same high standards there is always one best adapted to a particular duty. Minimizing friction losses, keeping maintenance costs constantly low, the right Fafnir makes possible full utilization of the productive capacity of plant or machine. Fafnir engineers, with more than a quarter century of service behind them, will help you to select this right type . . . The Fafnir Bearing Company, *New Britain, Connecticut*, Atlanta, Chicago, Cleveland, Dallas, Detroit, Kansas City, Los Angeles, New York, Philadelphia.



Hardening is one of the 77 operations in the manufacture of a Fafnir Ball Bearing, of which this Felt-Seal Bearing is a representative type.

**FAFNIR**

**BALL BEARINGS**

hand side of the machine. Thus it is unnecessary for the operator to touch the broach after it is placed in the machine, which permits him to apply both hands for changing workpieces. Additional output can be obtained by arranging the machine to pull two or more broaches at one time, each broach operating on the same type of workpiece or on different types as desired.

The height of the machine is 14½ ft. and the floor space required is 4½x8 ft. Maximum length of broach that can be used, 68 in. Largest diameter of work, 13 in. Maximum cutting speed, 18 ft. per minute and return speed, 24 ft. per minute. Motor recommended, 35 h.p., 7200 r.p.m. Net weight, 12,000 pounds.

## Heald No. 172 Adjustable Gap Grinder

The Heald No. 172 Adjustable Gap Internal Grinder now being made by Heald Machine Co., Worcester, Mass., replaces what was formerly known as the No. 72A Gap and, although retaining many of the valuable features of the latter, the No. 172 incorporates many new refinements of design together with new features which give the machine added flexibility, capacity and rigidity.

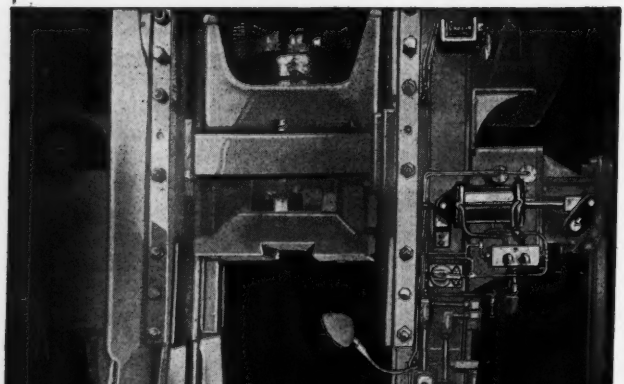
The No. 172 Adjustable Gap machine, like its predecessor, is a heavy duty machine designed to handle gears, plates, connecting rods, housings and similar parts with medium sized holes but requiring a generous work swing which are awkward to handle on the average machine.

The major refinements of design can be summarized as follows: capacity of the machine has been increased so that holes up to 12 in. in diameter with a grinding stroke of 15 in. can be ground; the gap is now adjustable for different lengths of work; the base is now considerably heavier than before for increased rigidity and is provided with an adjustable gap; the table is wider and heavier; the table ways are fully protected at all times; the workhead can be adjusted laterally to suit the length of work being ground.

The base has been made considerably heavier and gives a massive, rigid support for the workhead and work. The end of the base is stepped down and is provided with two carefully scraped flat ways on which a massive bridge holding the workhead can be moved to obtain an adjustable gap. The ways of the base are pressure lubricated, which insures a constant, definite film for the table to ride upon.

An oil reservoir is completely enclosed

**SAFETY - - - Operating Systems For Presses**



The safe operation of presses is now being efficiently accomplished by the use of HOPKINS AIR OPERATED REMOTE CONTROL VALVE SYSTEMS. Its versatility in application allows for countless varieties of installations, one to meet every need. These systems are for use as automatic or semi-automatic controls for other machines as well as presses. May we send you our Bulletin describing these systems?

THE TOMKINS-JOHNSON CO., 620 N. Mechanic Street, Jackson, Michigan

# FORMICA MAKES MACHINES *Easier To Sell*

FEW points about machinery are more important to a salesman than silent smooth operation, and that is why more and more machinery manufacturers are using Formica gears to quiet their drives. Formica helps to sell the machines.

For the same reasons maintenance men who have to keep machinery in good shape like to replace noisy metal gears with Formica. The material is sufficiently elastic to take up a lot of jolts and jars, protect the mechanism, and assure longer life.

The gear cutters named can give prompt service on one or many Formica gears.

**THE FORMICA INSULATION CO.**
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The Cincinnati Gear Co.
Cincinnati, O.
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Cleveland, O.
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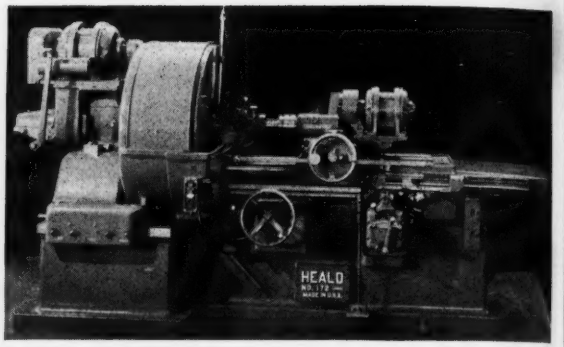
in the lower part of the base so that there is no chance for dirt or foreign substances to get into the oil. A purolator unit is connected to the oil supply line for purifying the oil used in the hydraulic system.

Push button control switches for the wheelhead and backshaft motors are now built into the right end of the base within convenient reach of the operator.

The main table has been made heavier and wider with larger ways and gives a remarkably stable support for the wheelhead. This combination of increased mass and supporting surface in conjunction with the Heald hydraulic drive gives an exceptionally smooth table action which can be varied to give any table speed within zero to 32 ft. per minute. The table ways are fully protected at all times against grit and dirt by two stationary steel shields.

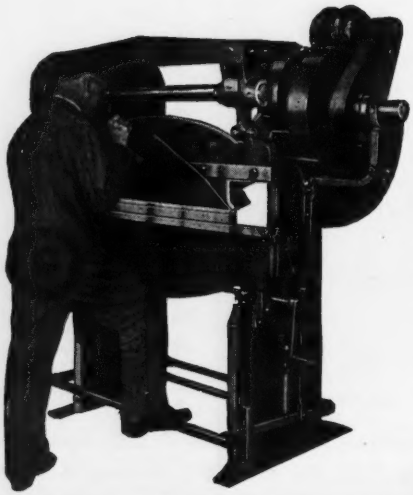
The workhead, which is of heavy-duty type, is mounted on a massive bridge which can be adjusted laterally to various gaps to specifically suit the length of work being handled thereby not only providing extra capacity for long work but also giving a construction so that the wheelhead spindle can be held to a minimum length for increased accuracy when grinding short work.

The work guard is opened and closed by a hydraulic cylinder and piston at the rear of the machine having a con-




**Heald No. 172 Adjustable Gap Grinder**


# THIS No. 253 CHICAGO STEEL PRESS



## Will Do 40% to 60% of the Forming Work Turned Out by the Average Shop

This compact, ruggedly built, 48", No. 14 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

**Write for Circular No. 253**

**DREIS & KRUMP MFG. COMPANY**

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CHICAGO ILLINOIS

# EACH SAYS IT IN HIS OWN WAY

"LOWER PRODUCTION COSTS"

"LONGER TIME BETWEEN RESHARPENING"

"BETTER WORK"

"FASTER CUTTING"

## *but* THEY ALL AGREE...

# THERE IS A *DIFFERENCE*

**NOTE ON THE MORSE TAPER SHANK:**

It should be clearly understood that "Morse Taper Shank" is a general term and may apply to the product of any manufacturer. It does not necessarily indicate a genuine Morse product. Specify Genuine Morse Tools.

The executive sees it in lower production costs. The tool room foreman in longer time between resharpening. The shop men themselves in better work — in faster cutting.

If you are of the opinion that there is no difference in metal-removing tools, try Morse Tools your own way in your own shop. It will pay you to prove "There Is A Difference."

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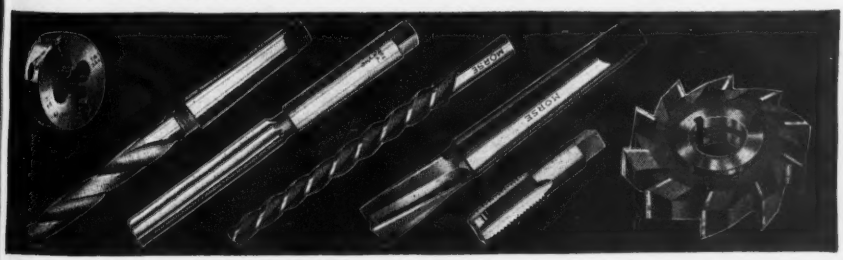

trol valve within easy reach of the operator. The work guard swings completely back out of the way to facilitate loading with an overhead crane.

The cross slide automatically gives coarse and fine feed as desired which, working in conjunction with properly set table dogs and a quick acting wheel truing device, gives a grinding cycle that, for a machine handling large work, is very fast, positive and nearly automatic

If desired, the No. 172 Gap machine can be furnished for a fully automatic grinding cycle by the Size-Matic principle, or can be furnished with a dial indicator that gives a direct reading at all times of the size of the hole being ground.

$250 For AN IDEAL MACHINE SHOP ARC WELDER!

• With the new Lincoln 150-ampere welder, you can cover the entire range of welding applications found in modern machine shop practice. Sheet metal fabrication. Building of jigs, fixtures and shop structures such as bases, tables, bins, etc. Maintenance work of all kinds, including pipe welding. The broad utility of this welder is due to its Class B Insulation. Get the details!

*Send for Bulletin on SA 150 Welder*

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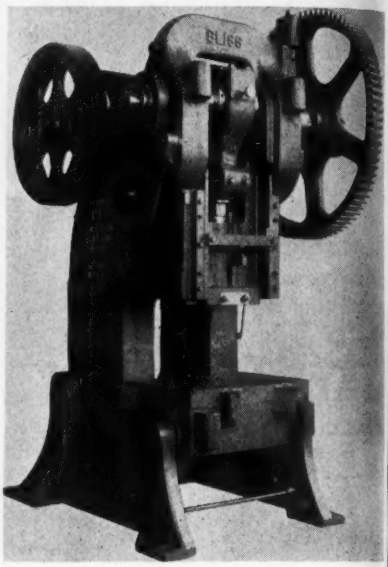
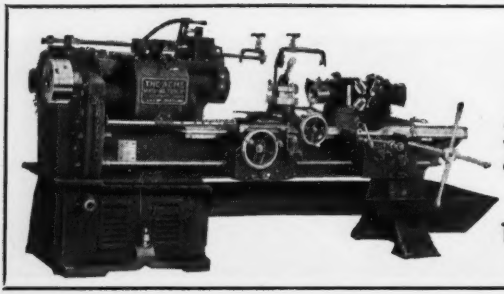
## Consolidated Inclinable Press

The E. W. Bliss Co., Brooklyn, N. Y., has augmented its line of "Bliss-Consolidated" presses by the addition of a




**Consolidated Inclinable Press**

heavy duty, adjustable stroke inclinable press. The press, as shown, is single geared and is arranged for direct connected motor drive. The latest designs in jaw and fast rolling key clutches are offered to suit the customer's requirements. Timken roller bearings and bronze bushed main and crankpin bearings reduced friction to a minimum.

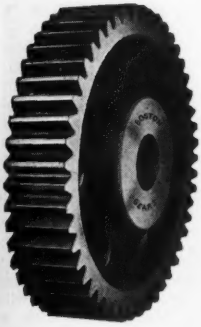


Cincinnati Acme Universal Turret Lathes

A powerful rigid machine for a wide range of accurate bar and chuck work.

*Write for Circular*

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO



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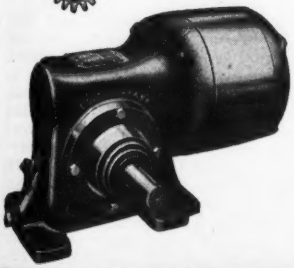
"From Stock," as applied to Boston Power Transmission Equipment means *far more* than simply buying "ready-made" Gears, Chain, Ratiomotors or Speed Reducers from a warehouse. First, the cost of Power Transmission can be cut only *by correctly designed and manufactured* products — and, secondly, these products *must be readily available*, in the type and size you want. This two-fold service is offered by the Boston Gear Works . . . the result of 50 years experience, in the making of *modernized and standardized* power transmission equipment. "From Stock" as applied to Boston Gear Power Transmission Equipment means exactly the right part — at the right price — delivered in a few hours from 35 distribution centers from coast to coast.



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*Your Tool-Room Work*
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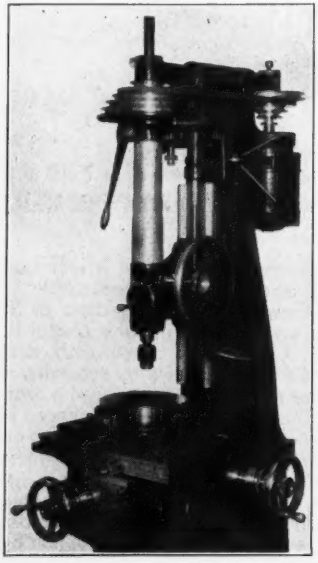

**The New Moore High Speed**
**Precision Jig Borer**

Lead Screws hardened, ground and lapped to an accuracy of .00005" per inch.

Large Dials give direct Vernier reading to .0001"

Table Travel 9 1/8"x14¼"

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**MARBURG BROS. Inc.**
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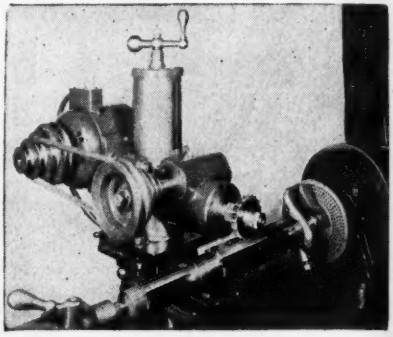
*See us at the Cleveland Show.*

The stroke is adjustable for 2 in., 4 in. and 6 in. with a die space of 19 in. for the 2-in. stroke, 18 in. for the 4-in. stroke, and 17 in. for the 6-in. stroke. The adjustable eccentric is locked rigidly in place by a patented rolling key device and the adjustment is extremely easy and convenient to make. The press operates at 40 strokes per minute when geared and may be arranged for optional geared and non-geared operation in special cases.

## Master Lathe Converter

To meet the demand for a precision attachment of universal range with which a variety of operations such as internal grinding, angular milling, end milling, tool grinding, gear cutting, and other operations can be performed on the lathe, the Master Machine & Tool Company, Armour and Erie Sts., North



**Master Lathe Converter mounted on a lathe and performing a milling operation on a splined shaft.**

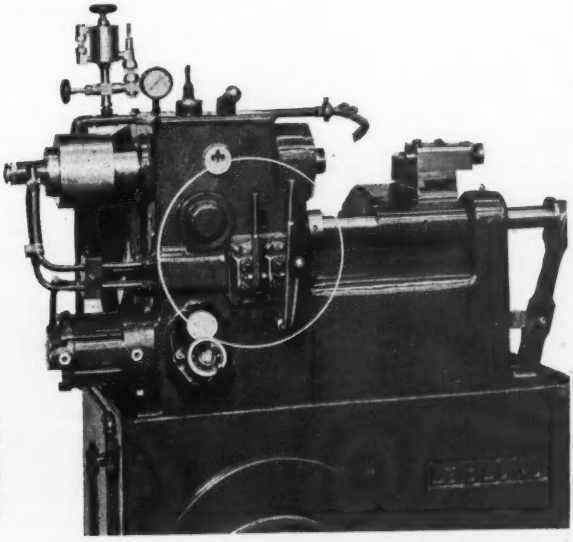
Kansas City, Mo., has brought out the Master Lathe Converter shown in the illustration. The converter is intended for application to the lathe, and it is stated that it is so quickly set up and so easily moved from lathe to lathe that it is often easier and more economical to set up the converter in order to perform a special operation on heavy work which is already set up in a lathe than it is to move the work from the lathe to an individual purpose machine. The advantages claimed for the converter are ease of setting up on the lathe, saving of floor space, and the universal range of the attachment.

The Master Lathe Converter is available in two types and three models, adaptable to lathes with swings of upward of 9 in. The small model is of

# ROSS Operating Valves

"The Bridle for Air Horsepower"

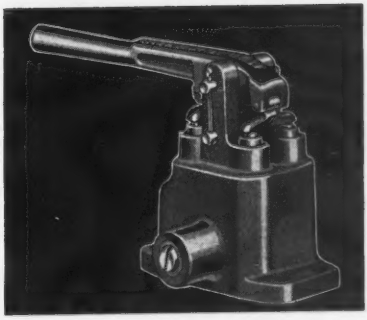
## on LeBlond Lathes



New 11" Special Lathe—Feed engaged by cam-operated Ross valve. A hand controlled Ross Operating Valve controls an air chuck—another moves slide to working position.

### No Lapping— No Grinding

Flexible discs, used in the valve stem assembly, are seated by air pressure. Air-tight seal assured over long period of service. That's just one reason why so many machine tools are equipped with Ross Operating Valves. Write for catalog demonstrating other advantages.



**Ross Operating Valve Co.**

6488 Epworth Blvd. Detroit, Mich.

the four-post type, while the two larger models are built with a single rigid center post.

The illustration shows the Model A Master Lathe Converter mounted on the compound rest of a lathe and performing a milling operation on a splined shaft. It is readily noted that the attachment is separately motored and the power is transmitted to the milling head by means of a V-type belt. A variety of speed changes is available through the use of two four-step cone pulleys. A worm gear is utilized in the milling head to obtain a 22:1 ratio for the milling spindle, thereby assuring a large amount of power for the milling cutters. There are five ball bearings in the milling head, two of which are fitted into the extreme end of the head to take up end thrust and to assure a minimum of friction and play in the spindle.

By substituting a grinding head for the milling head, the same converter is used for grinding operations. The change from one head to the other is accomplished by the removal of only three bolts. As a tool post grinder, the converter has a very wide range in that the vertical movement of 11 to 12 in. allows it to be raised above the work so that the wheel can be lowered into the flutes on such work as hobs or reamers, thereby grinding the faces of such tools rather than outside diameters only.

Four sets of holes in the base plate provide for mounting the converter on the compound rest in direct line with the cross feed or at right angles. Thus any angle may be obtained for end milling, drilling or grinding. By using an internal grinding head with an extended casting, it is possible to perform internal grinding operations to approximately 14 in. diameter. Spindle speeds ranging from 1750 to 4750 r.p.m. are available with the present set up of the grinding head and speeds up to 20,000 r.p.m. may easily be obtained by changing the sizes of the pulleys.

The grinding wheel can be changed almost instantly from right to left merely by reversing the position of the wheel and pulley on the grinding spindle and changing the pulley on the drive shaft of the motor from the right to the left side. The direction of the motor itself may be changed either by merely inverting the motor on the telescope rest or by loosening two set screws and changing the direction of the brushes. These various changes of position of the wheel, motor direction, and so on facilitate grinding operations which otherwise may be quite difficult.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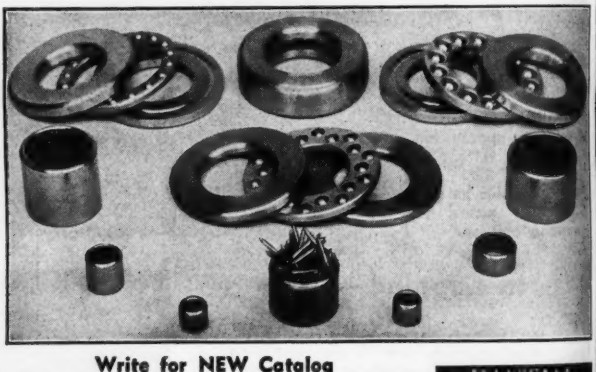
THAT'S the way industry has been flocking to Bantam for bearing requirements, whether they be Ball Thrust, Roller Thrust or Journal Rollers. An 800% increase in demand since 1932. After all, "the proof of the pudding is in the eating," so why not try Bantam Bearings once? From then on your own good judgment will bring you back for more.



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# FARREL

## HYDRAULIC PRESSES for METAL FORMING

The development of the hydraulic press with self-contained power unit has brought to the forming of metal parts certain definite advantages. Hydraulic power is simpler, smoother, more flexible, probably the most adaptable power obtainable for exerting uniform pressures with maximum accuracy in metal forming. And it is more economical.

The smooth, even application of fluid power reduces metal tearing and "spring-back" to a minimum. There are fewer press-overs and rejects. Life of dies is prolonged. Less time is lost in subsequent assembly operations. Higher net output per machine and man-hour results.

These and other advantages of Farrel Hydraulic Metal Forming Presses are described in this new illustrated bulletin which we have prepared for distribution to production executives and engineers in the automotive, aviation and other industries producing formed metal parts.

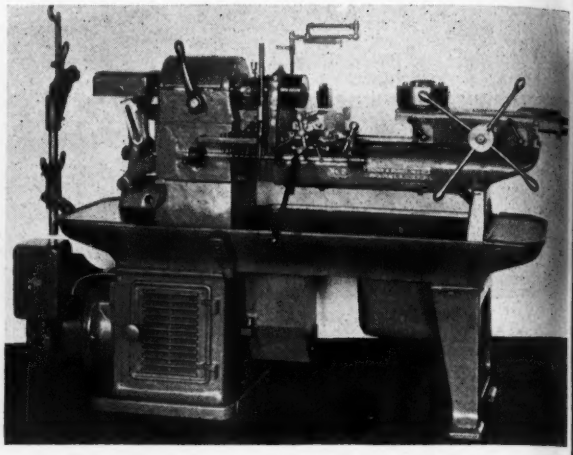
Your copy will be sent upon receipt of request on your company letterhead.

## FARREL-BIRMINGHAM COMPANY, Inc.

44 Main St., Ansonia, Conn.

**BROWN & SHARPE WIRE FEED SCREW MACHINES**

Introduction of its newly designed No. 2 Wire Feed Screw Machine by the Brown & Sharpe Mfg. Co., Providence, R. I., completes the range of three sizes in its line of semi - automatic Screw Machines, each size being built in a motor and overhead-driven type. These machines are efficiently and cheaply set up for small run jobs, or for parts subject to frequent changes in design where special tooling is not warranted.



B & S No. 2 Wire Feed Screw Machine.

A wide speed range and high spindle speeds are provided so that all classes of materials can be machined at the maximum speed their machinability will allow. Full advantage can be taken of the free-cutting materials such as brass, aluminum and high sulphur steels. The high ratio (5 to 1) between the fast and slow speeds enables a slow speed to be used for threading and the other operations such as forming, turning, drilling, cutting off and so on, performed

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## ...AND HEAR THE YEAR'S 107 BEST METAL TALKS

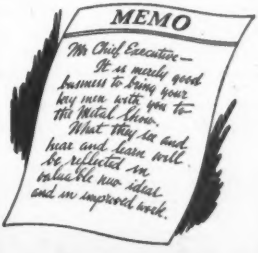
THE metal man's annual opportunity to hear and discuss the work of outstanding experts in the metal industry, is provided at the sessions of the National Metal Congress, to be held this year in Cleveland, October 19 through 23.

Programs of the five great Societies participating in this year's Congress are studded with technical and practical authorities from every branch of the metal industry.

More than 175 men have cooperated to prepare 107 talks dealing with the latest news of metals and their use. In the course of some fifty technical sessions, there will be discussion of all phases of production, selection, fabrication, testing, inspection, treatment, welding and application of all kinds of metals.

Sessions will be so arranged that programs will not conflict — you will have opportunity to hear the important talks on the subjects nearest your heart.

And please remember — the Congress is only half the attraction. The other half is the huge National Metal Exposition staged at the same time. Together they provide a great Metal Show that you dare not miss. The hundreds of exhibits, the exchange of ideas, the making of new friends and the meeting with old ones — all combine to bring you up-to-date and get you set for the year ahead. If you have not made hotel reservations, do so today and plan to attend.



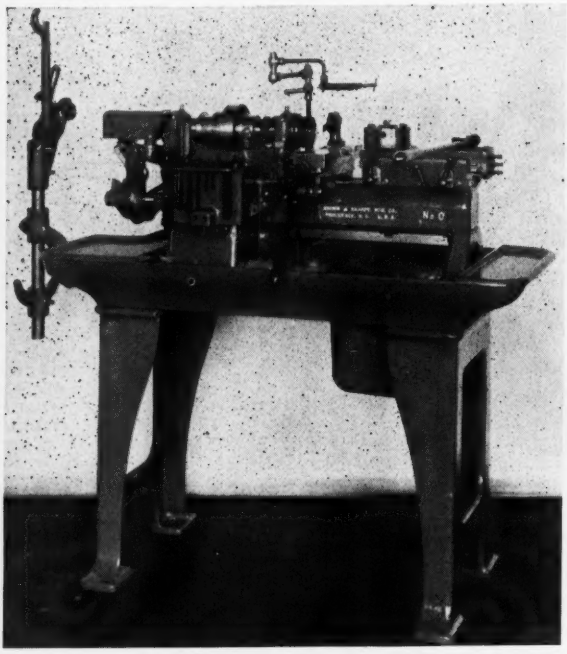

● For complete details regarding programs and exhibitors, write W. H. Eisenman, Managing Director, National Metal Congress & Exposition, 7016 Euclid Ave., Cleveland, O.

# NATIONAL METAL SHOW

CLEVELAND, OHIO — OCTOBER 19-23, 1936

*COOPERATING SOCIETIES*

AMERICAN SOCIETY FOR METALS — AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS
AMERICAN SOCIETY OF MECHANICAL ENGINEERS — AMERICAN WELDING SOCIETY — THE WIRE ASSOCIATION



**B & S Wire Feed Screw Machine.**

at the maximum rate of surface speed possible. On motor driven machines, the drive for the slow speed is obtained by chain and sprockets which gives ample power for heavy threading operations.

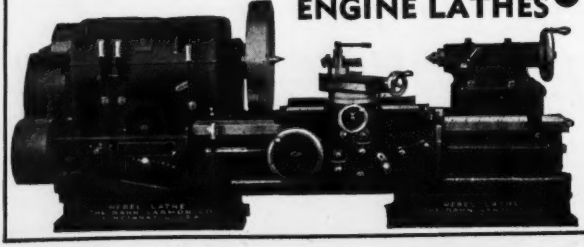
Time-saving features of automatic feeding of stock, fast indexing of turret, and convenient means of reversing spindle assure high rates of production. Adjustable stops on cross slides and turret slides, together with the high class workmanship with which these machines are built, permit very close tolerance to be maintained on the work being produced. The positive clamp for turret slide bed is another aid in providing rigidity and assuring accuracy.

While primarily intended for bar work, these machines are also efficiently adapted to secondary operations on work that can not be completed on the bar. The threaded nose of the spindle permits use of standard chucks and special fixtures for performing operations on forgings, castings, stampings and similar articles.

The bar capacity of the machine is large and oversize feed tubes are available to allow handling of larger stock, for light work, than the rated normal capacity. Collets, feeding fingers, and many turret tools used on these semi-automatic machines are interchangeable with those used on Brown & Sharpe Automatics.

While generally consistent in design with the smaller capacity machines, the No. 2 size has additional features which are especially valuable on the larger classes of work produced in this machine. The automatic clamping of the turret provides the rigidity required for heavier cuts. The cross slide is arranged with longitudinal feed by hand, which is a feature that can be used to good advan-

GEARED HEAD & CONE DRIVEN ENGINE LATHES



Sizes 16" to 36" Swing

A full line of Gap Lathes, 16" to 50" swing.

Write for complete information.

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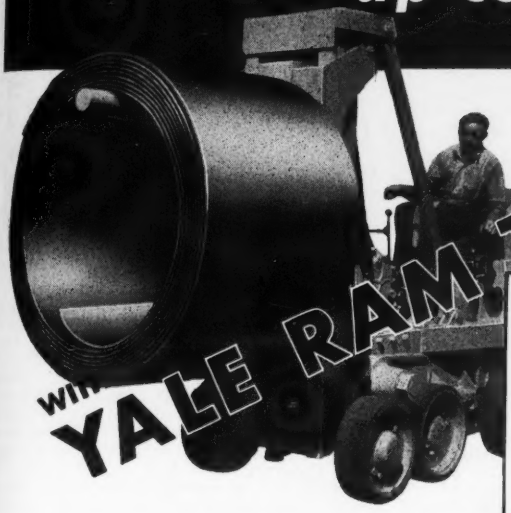
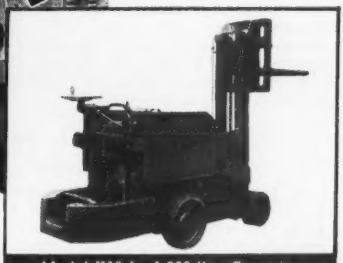
CINCINNATI, OHIO

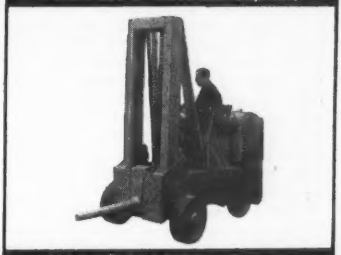
# REDUCE HANDLING COSTS up to 80%



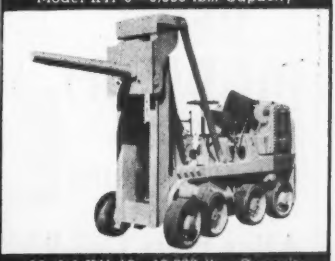
WITH YALE RAM TRUCKS



Model K30-5—5,000 lbs. Capacity



Model K41-8—8,000 lbs. Capacity



Model K41-16—16,000 lbs. Capacity

Eight-wheel steer—Four-wheel drive—Power and manœuverability for handling loads up to 20,000 pounds.

Yale builds a complete line of trucks of every conceivable type and capacity for all classifications of materials handling.

A Yale engineer, thoroughly familiar with handling problems, will gladly call at your request and recommend the equipment that will produce the greatest earnings for you.

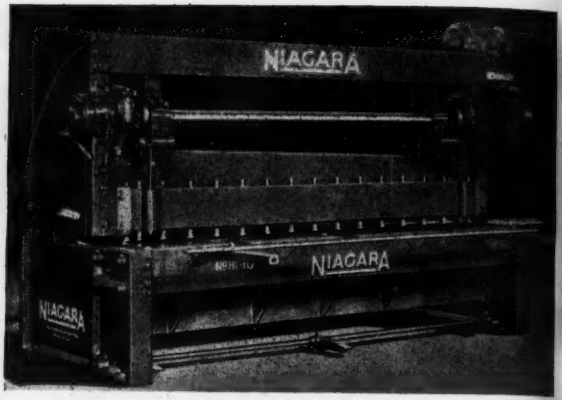
The nearest Yale representative is no further away than your telephone.

TRADE YALE MARK

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION—PHILADELPHIA, PENNSYLVANIA

age for turning behind a shoulder. The motor driven machines are driven from a single motor mounted on the base.

The machines have the following rated capacities: No. 0, 3/8 in.; No. 1, 5/8 in., and No. 2, 1 in. Turn any length to 2¼ in., 4 in. and 6 in. respectively. Oversize feed tubes are available to allow handling of larger stock for light work. On the motor driven machines there are 20 changes of spindle speed, 10 in either direction, made by change gears. On the overhead driven, there are 9 changes, 6 forward and 3 backward. Spindle speeds in every case are provided in ranges to permit machining the rated stock diameter at maximum allowable surface speeds.




Niagara Series HL Power Squaring Shear.

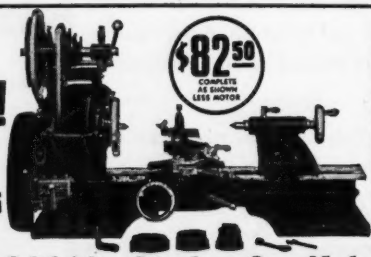
## Niagara Series HL Power Squaring Shear

A power squaring shear designed for high production accurate flat strip cutting, yet employing all the features of a general purpose squaring shear, has been brought out by the Niagara Machine & Tool Works, Buffalo, N. Y. One of the principal features of the machine consists in that a heavy steel plate structural member is bolted and doweled to the top of the housings in exactly the right position to counteract the upward thrust of the center bearings and the direct thrust from the hold-down mechanism. At the same time, this member ties the entire machine together at the upper end.

The Niagara triangular box section steel crosshead with rearwardly sloping front web permits a very large opening between the hold-down bar and the crosshead, thus giving perfect vision to the cutting line of the machine. This opening, combined with the fact that the top of the hold-down bar is very low, enables the operator to view the cut with ease and without straining when shearing to a line.

The bed is a massive one-piece high tensile iron casting with three hand holes and four T-slots for the convenience of the operator and with pockets so that knife bolts are accessible from the top of the bed. The broad deep flat surfaces at the end of the bed have heavy keyways in the center which engage broad keys resting in the housings. The bed is adjustible front to back, being guided by these keys which make it impossible for the bed to lift off its seat when the shear is cutting. The Niagara patented box section steel holddown is toggle operated and has inde-

NEW! MODERN! Atlas METAL WORKING LATHES




HAS: automatically reversible power feeds. Built in counter shaft and motor bracket. 10" swing. Takes 18" between centers. Attachments available for all lathe operations. Accuracy guaranteed to within .001". Write TODAY for complete catalog of lathes, arbor presses, drill presses, tools and attachments. Before buying a small lathe, it will pay you to investigate the NEW ATLAS.

Atlas Press Co., 946 No. Pitcher St., Kalamazoo, Mich.

# ELECTRIC ARC WELDER

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**Amazing Machine with Efficiency of Arc Welders Selling for $150 and More Now Offered At Breath-taking Low Price.**

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Aladdin Arc Welder works from any 110 or 220-Volt socket. Just plug in and do practically any welding job right on the spot in a few minutes time. Also does soldering and brazing. Current strength completely controllable. Unusually stable arc. Economical. Current cost only few pennies an hour. Easily carried in auto or side-car. Simple detailed instructions included—make expert welding easy for anyone with little practice. Mail coupon now for details.

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**Prevents cutting and scratching hands... eliminates waste in handling the paper-thin brass.**

**Supplied without charge with order for the shim stock it holds.**

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610


pendent feet exerting increased pressure very close to the knife edge, thus facilitating accurate cutting of flat narrow strips. The drive is by means of a train of generated spur gears enclosed in a box and running in a bath of oil. All gears including the main clutch gear and the outer end of the main eccentric run on anti-friction bearings. The Niagara 14 point engagement sleeve clutch with single stroke attachment and anti-friction bearing throwout is mounted within the gear box so as to operate in oil.

The main members of the machine are so placed that vision is unobstructed from the front of the machine to the back, thus minimizing the danger of the operator engaging the clutch while a second operator or helper is in a dangerous position at the rear of the machine.

---

## Detrex Solvent Degreasing Machine

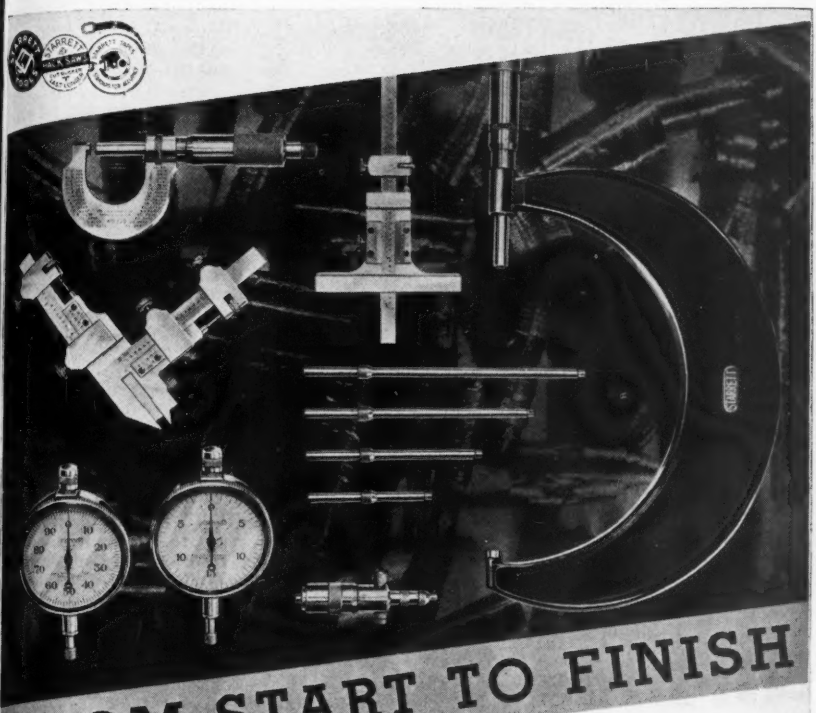
A two-dip solvent degreasing machine, designated as Size 624, has been added to the line of Detrex Degreasers manufactured by Detroit Rex Products Company, 13017 Hillview Avenue, Detroit, Michigan.

Among the important features of this machine are a water jacket type of condenser completely encircling the machine, and a solvent collecting trough located directly beneath the condenser. By this arrangement of the condenser and condensate collecting trough, the solvent vapors are held within the machine and all of the pure solvent distillate is emptied directly into the second or rinse chamber, thus continuously renewing the rinse chamber with pure solvent.

With this type of degreasing machine, the work is usually handled manually in baskets or on racks. For convenience, especially when comparatively heavy loads are cleaned, a small hoist may be employed.

This machine is used for both immersion and vapor cleaning. In the usual sequence of operations the work is immersed in the boiling chamber, cooled in the clean solvent rinse, and finally suspended for a few seconds in the pure solvent vapors over the boiling chamber. The work is removed clean and dry. This complete cycle of cleaning operations is accomplished in less than a minute and yet every trace of oil and grease is removed.

Either "Perm-A-Clor" or "Triad" stabilized chlorinated solvent is used in Detrex Degreasers. These solvents are non-inflammable and non-explosive and have a solubility factor for oils and



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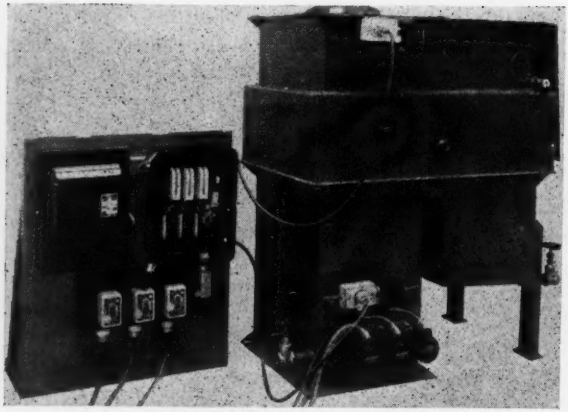

New design of Detrex Degreasing Machine for the cleaning of metal parts.

greases more than four times that of ordinary organic solvents. The solvents are used over and over with but slight maintenance. The contamination resulting from the cleaning operation is removed from the solvent by periodic distillation within the machine. To facilitate this cleaning operation, there is an outlet from the solvent trough at one end.

The unit shown is especially arranged for electric heating, using three immersion type heaters. It is equipped with both top and bottom thermostats (expanded metal guard has been removed from top thermostat to show construction). The relay and switch equipment for this unit can either be placed on side of degreaser or mounted on a separate panel as shown.

These Detrex Degreasers are also designed for steam or gas heating.

## Hanna Squeeze Riveter

A light, compact, pneumatic riveter of the alligator type, to be known as the Hanna Squeeze Riveter, has been brought out by Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. This riveter

**Grinds**

**81 SIZES OF**

**Drills**

**No. 31 to ½"**

**This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.**

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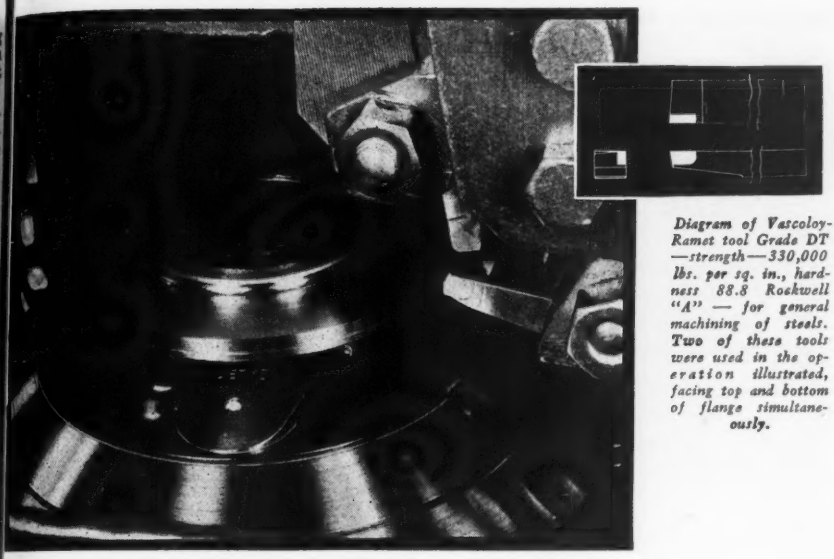

*Diagram of Vascoloy-Ramet tool Grade DT —strength—330,000 lbs. per sq. in., hardness 88.8 Rockwell "A" — for general machining of steels. Two of these tools were used in the operation illustrated, facing top and bottom of flange simultaneously.*

*Facing Automotive Axle Assembly Part. Material: heat-treated steel SAE 3140, 387 Brinnell. In the photograph the tools are shown lifted out of cutting position for removal of finished piece. Performance of Vascoloy-Ramet tools:*

| Feet Per Minute | Feed Per Revolution | Amount of Cutting | Depth of Cut | Time of Cut per Piece | Pieces per Grind |
|---|---|---|---|---|---|
| 115 | .020" | Facing top and bottom of flange | .030" to .040" | 27 Sec. | 95 |

Here is an amazing example of Vascoloy-Ramet's supremacy in the machining of steels.

Previous practice for the operation illustrated required three steps:

1. Annealing the steel for machining.
2. Re-hardening.
3. Finish grinding.

Vascoloy-Ramet Grade DT elimfnates two steps by completely machining the heat-treated steel in one operation requiring only 27 seconds!

Grade DT is one of fifteen grades of Vascoloy-Ramet, which covers a wider range of uses than any other tool material. Unrivalled in the machining of all steels, it stands alone as the only material capable of turning steel without "cratering".

It also excels in performance on cast iron, semi-steel, and non-ferrous materials.

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Vascoloy-Ramet Division
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THERE is a Skinner Chuck for any work — square, round or odd-shaped — worthy of the fine tools used in precision manufacturing.

That is one reason many builders of fine machine tools supply Skinner Chucks as original equipment.

There is no compromise with quality in the design, materials or workmanship for Skinner Chucks.

Write for Bulletin No. 48 (Hand-Operated Chucks) or No. 48-P (Power-Operated Chucks).

LONG LIFE STRONG GRIP

SKINNER CHUCKS

THE SKINNER CHUCK CO.

NEW BRITAIN, CONN., U. S. A.


weighs but 100 lbs., the light weight having been made possible by the use of alloy steel heat treated castings, alloy steel forgings, and aluminum castings. Suspended from a spring balancer, as shown, it is easily and quickly moved from one operating position to another.

Hanna Squeeze Riveter

The mechanism is entirely enclosed. A hardened and ground alloy steel wedge, attached to the aluminum piston unit, transmits power to a hardened and ground roller mounted in roller bearings in the moving jaw. The moving or driving jaw closes upon the rivet and exerts a uniform, predetermined pressure on the rivet even though the variation in the length of rivet and grip may be as much as ¼ inch.

The riveter is operated practically by a "twist of the wrist." This novel arrangement is an integral part of the handle used by the operator in "nudging" on and off the rivet. Power consumption is the minimum, air being used only for the forward or pressure stroke and the return stroke being spring actuated.

The riveter exerts 10 tons of pressure on the dies which is sufficient for driving up to ¼-in. rivets cold and ⅜-in. rivets hot. Considerable variation in the shape of the jaws to meet the clearance conditions of the work is possible.

## South Bend Pedestal Motor Drive 9-In. Workshop Lathe

The South Bend Lathe Works, South Bend, Ind., announces that the 1936 Model 9-In. Workshop Lathe is now available with pedestal type of motor drive. The pedestal motor drive mechanism is a separate unit mounted on a metal pedestal back of the lathe, with a horizontal countershaft and motor supported at the top of the pedestal in line with the headstock cone pulley.

# YES-UP TO 21-INCH BORE!

Rugged giants they are, in their ability to carry loads and stand up to punishing jobs. Yet they have all the PRECISION, the fineness, the friction-free smoothness, of their pigmy brothers in the NORMA-HOFFMANN line. *** And, between the biggest and the smallest, a complete range of sizes is available—each marked by the family quality of PRECISION.*** There's a PRECISION Bearing (ball, roller or thrust) for every load, speed and duty.

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"NORMA-HOFFMANN"
PRECISION BEARINGS
BALL. ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

total stroke of 24 in. Cylinder diameter the countershaft and the headstock regulates the tension of both the flat belt between the cone pulleys and the V-belt from motor to drive pulley. A belt

**South Bend Pedestal Motor Drive 9-In. Workshop Lathe**

tension release lever attached to the tension brace permits easy shifting of the cone pulley belt from one step of the pulley to another. When the lever is pulled toward the operator the motor drive is tilted forward on its pivoting frame sufficiently to easily shift the spindle belt.

The Pedestal Model Drive is available for all sizes of South Bend floor leg lathes. The lathe is relieved of all strain, as the weight of the motor is supported by the pedestal, and the adjustable tension brace between the countershaft and the lathe headstock counteracts the pull of the driving belt.

Among the advantages of the Pedestal Motor Drive is the fact that the motor is entirely apart from the lathe, thus eliminating vibration; silent belt drive providing a smooth, steady pull; no overhead belts; screw type belt tension adjustment for any desired pulling power, and belt tension release for shifting to change spindle speeds.

The South Bend 1936 Model 9-In. Workshop Lathe was announced on Page 120 of the April 1936 issue of MODERN MACHINE SHOP.

## Gisholt Thread Chasing Attachment

A thread chasing attachment for the No. 3, No. 4 and No. 5 Ram Type Universal Turret Lathes, designed to cut extremely smooth and accurate threads has been announced by the Gisholt Machine Company, 1217 E. Washington Ave., Madison, Wis. This attachment is designed for cutting, with die heads or taps, threads that must be in perfect lead, long threads where a cumulative error is unpermissible, and fine threads. Another field of use for this attachment is the threading of hard metals such as stainless steel and copper, which have a tendency to tear, and in the threading of soft metals such as aluminum or die castings.

The attachment of the leader and follower type, consisting of a bracket for carrying the followers, a means of mounting and driving the leader, and suitable means for starting and stopping the thread feed. The leaders may also be used with the universal carriage

**Speed Up Name Plate Numbering**

**By Use of the New**

**NUMBERALL PLATFORM & QUICK CHANGE NUMBERING MACHINE**

For brass, aluminum, and other soft metals hit the knob with the ball of the hand. Remove knob for hammer stamping untempered steel. Last wheel turned by means of knurled knob for consecutive numbering, other wheels changed by flipping up arm of platform.

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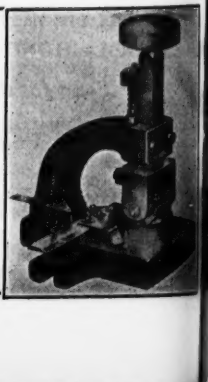
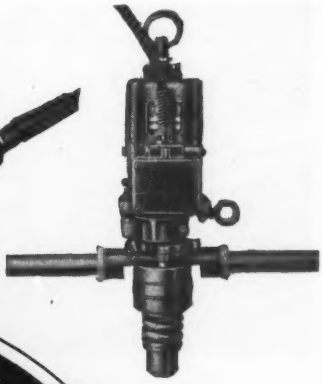
**NUMBERALL STAMP & TOOL CO., Inc.**
379 Huguenot Ave., Huguenot Park, Staten Island. N. Y.



# Hicycle

ELECTRIC TOOLS



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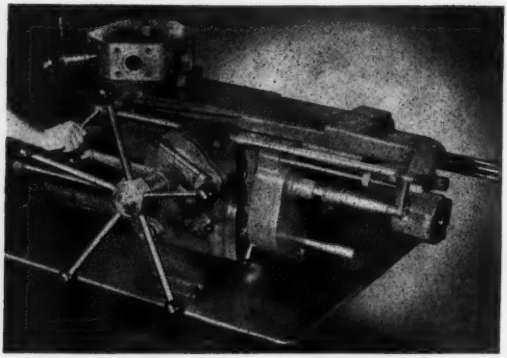

**Gisholt Thread Chasing Attachment**

thread chasing attachment and are available with either standard milled threads or special ground threads. The leader is mounted on a shaft which is driven through a gear box at exactly the same speed and in the same direction as the feed shaft which, of course, is in positive relation with the rotation of the spindle or workpiece.

A collar, adjustable throughout the entire length of the tur travel, serves as a threadi feed trip. It releases a sin tooth positive clutch drivi the leader shaft and as the f lowers remain in engageme with the leaders, the travel the turret is stopped and t die head moves forward on thread to trip itself.

By using a selective gear h which is coupled to the fe shaft, one leader will cut thr threads having one, two a four times the pitch of t leader. The threading capac is from 4 to 32 threads. T gear box permits the use coarse pitch leaders and follo ers when cutting fine pit threads. For example, to c 24 threads with this gear b a 12-pitch leader would be require With the gear box, a 6-pitch leader m be used. Also, when a wide variety threads must be provided for, the ge box greatly reduces the number of lea ers required. The selective gear box al makes available three changes of eig feeds, 24 in all, ranging from 0.001 0.104 inch.

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SPECIFICATIONS

¼ H. P. ball bearing 1725 R.P.M. motor —25 gallons per minute with 10 ft. head —iron body—bronze impeller—spring tension packing — straight or priming cover optional—pump shaft replaceable.

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Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster, as his fingers actually become geared to the Knurled Head so they can't slip.

Smooth Head Screws, hard to get hold of are much slower to drive.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako",—

**BUT COSTS NO MORE.**

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Fingers become geared to the knurled "Unbrako" and therefore can't slip

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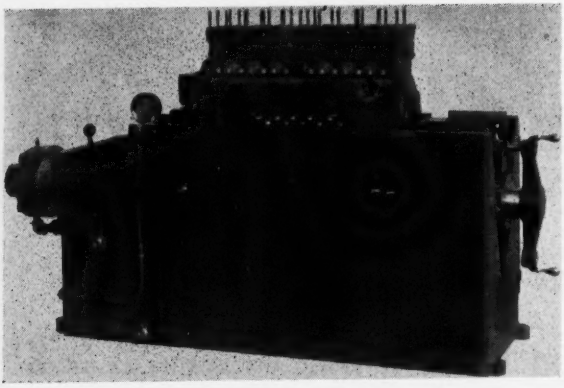


Fig. 1—Oilgear 15-Ton Camshaft Bushing Assembling Press

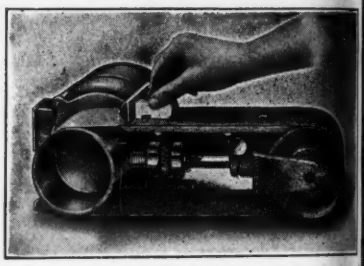
## Oilgear 15-Ton Camshaft Bushing Assembling Press

Accurate assembly of four camshaft bushings in six cylinder motor blocks, or five camshaft bushings in eight cylinder motor blocks, is accomplished on a high production basis with this modern 15-ton horn type assembling press which has been brought out by The Oilgear Company, 1405 W. Bruce St., Milwaukee, Wis. Fig. 1 shows a side elevation of the press with an eight cylinder motor block in position ready to be lowered over the horn type bar for the assembling operation. The five camshaft bushings which are pressed into the eight cylinder motor block in one operation are shown on top of the press frame. Both the pressing bar and the fixture for raising and lowering the cylinder block are hydraulically operated, the bar being controlled by the hand lever and the fixture by the foot pedal.

The pressing bar is accurately guided in a long bushing and is located by a pin and bushings which are shown in the double lever on the right hand end of the press. When bushings are assembled in six cylinder motor blocks the horn type bar is revolved 180 deg. so as to bring the opposite side of the bar—which has four horns—into the proper operating position. The press


• NEW! •

SPEEDY---
SURFACER



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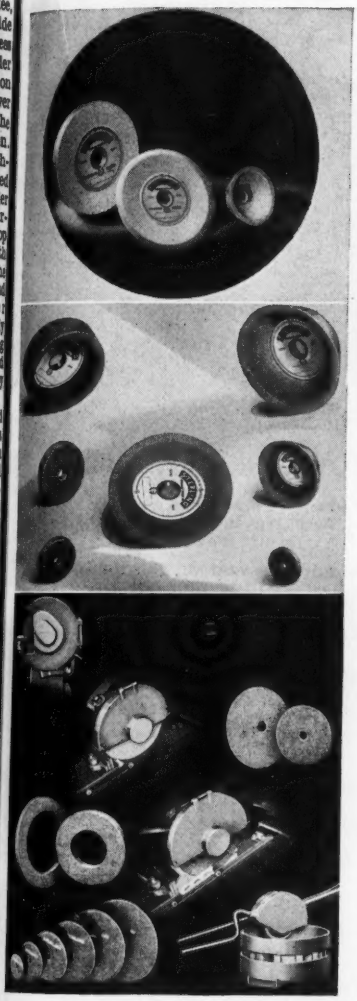

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have been used for new and old established metals in many countries, their ability to do the work required is today unquestioned.

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**THE STERLING GRINDING WHEEL COMPANY**

*Abrasive Division of The Cleveland Quarries Company*

Factory and Office: TIFFIN, OHIO CHICAGO: 912 W Washington Blvd. DETROIT: 101-107 West Warren Avenue

**STERLING ABRASIVES**

ram is of all steel welded construction and especially low in design so as to fit into the production line as a part of the conveyor system.

When assembling five camshaft bushings on the eight cylinder motor block, the operator threads the proper size bushing on each of the five hardened horn noses as shown in Fig 2. A short pin on each nose locates the bushing oil hole, then the motor block is moved from the conveyor onto the press fixture as shown in Fig. 1. Depression of the foot pedal operates the hydraulic mechanism which lowers the fixture and block over the horns, the pins locating the block in a fixed position. Upon moving the hand lever to the left, the piston pulls the horn type bar and presses all of the bushings into place. Shifting the hand lever to the right returns the bar, and depressing the foot pedal raises the fixture and block to conveyor height where the block is unloaded.

When four camshaft bushings are to be assembled in a six cylinder motor block, one simple adjustment is necessary. The operator moves the large locating pin out of position and revolves the horn type bar 180 deg. so as to bring the opposite side of the bar, which has four horns, into proper operating position. The large locating pin is inserted

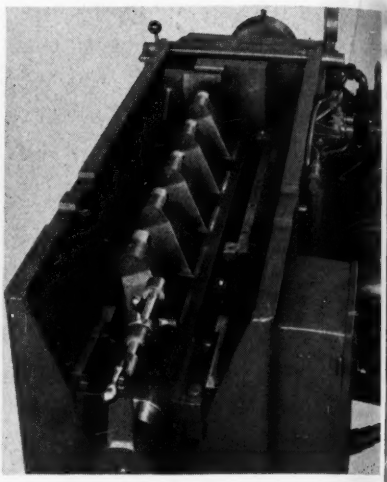
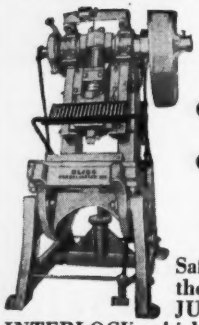


**Fig. 2—Plan view of press showing construction of horn type pull bar and motor block fixture.**

in the opposite end of the double lever, while new locating pins for the six cylinder motor block automatically becomes

**Junkin Safety Guards**



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- **Increased Production**

Safety is assured by the exclusive JUNKIN TRIPLE INTERLOCK which locks presses until guards are safe. For safety, economy and efficiency equip your presses with Junkin Safety Guards. Recommended for all type inclinable and small presses.

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Unusually Comfortable Rooms, Good Food, Carefully prepared, and Moderate Rates.

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**Will Cut All Kinds Of Tubing Angles Structural Steel**

## WELLS Metal Cutting BAND SAW

- Reduces Cutting Time
- No Coolant Required
- Cuts Any Metal
- Extreme Precision

FROM 30 to 50% in cutting time can be saved with the Wells Band Saw. Hundreds of duplicate pieces can be cut without showing a variation of .005" in thickness. Used in tool room or maintenance work—or for quantity production where extreme precision is demanded—savings made in time and labor costs soon show an attractive figure. Look into these advantages. Send for the descriptive folder today!

**WELLS MFG. CORP.**
THREE RIVERS, MICHIGAN

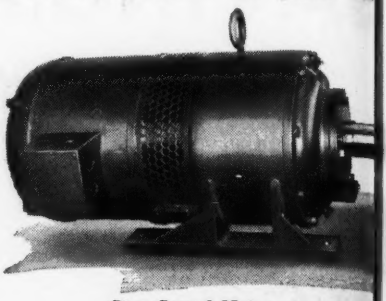
active. The second operation is the same as for the eight cylinder block. With this machine a common conveyor line can be used for both six and eight cylinder blocks, the machine easily being changed to suit the blocks in production.

The pump and motor base are integral with the press frame. An Oilgear Type RSA-6 Pump direct connected to a 10 h.p., 900 r.p.m. electric motor operates the pull bar. An auxiliary low pressure pump with texrope drive operates the toggle cylinder for raising and lowering the cylinder block.

The capacity of the press is 15 tons. The stroke is adjustable 1½ in. Pulling time is 1 second; return time, 1 second; lowering time, 3 seconds; raising time, 3 seconds. Length, 96 in.; width, 52 in.; conveyor height, 34 in. Weight, 6200 pounds.

## Star Geared Motor

Illustrated is one of a new line of geared motors now being built by the Star Electric Motor Co., Bloomfield Ave., Bloomfield, N. J. The motors are available in both horizontal and vertical designs and from ¼ to 75 h.p.. Single and multiple reductions are supplied to suit requirements at the output shaft. High speeds are transmitted through an offset type of motor while a motor of the planetary type is intended for use in the transmission of low speeds. The

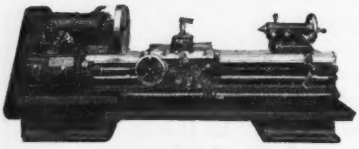


Star Geared Motor

reduction unit is designed to operate with overhung loads.

The gearing is mounted in a steel housing and the motor frame is standard in order that standard parts may be supplied for the motor end. Any type of motor, either squirrel-cage or slip-ring, in open or closed design, can be supplied. Both the gear reduction unit and the motor are built by this company. The unit is available with an integral brake.

**Real Production**
**with**
**G-K Single Lever Control Lathes**



● With fewer handles or levers to operate, G-K Single Lever Control Lathes make it possible to turn out work more quickly and with greater ease.

This and other outstanding features about which we shall send information make G-K Lathes ideal for the efficient shop. Write for catalog.

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**605 W. Washington Blvd.**
**Chicago, Ill.**

# The Bridgeport "Master"

## HIGH-SPEED MILLING ATTACHMENT

WILL

## MILL, DRILL AND BORE

AT

# Any Angle

**Eliminates need for many special fixtures, vises and angle plates.**

**Investigate the applications of this tool thoroughly. We believe it to be the most versatile all round unit that can be bought. It can be used for milling, drilling and boring at any angle without changing the setup of the work. A precision tool that can be depended upon to take care of the most accurate type of work.**

**SPECIFICATIONS—**

**The chrome-nickel alloy steel spindle, heat treated and accurately ground has a No. 2 Morse Taper. Collets to fit from ⅛" to ½" dia. Quill is treated with a special chromium process giving it a surface hardness one point below the hardness of a diamond. Housing is lapped and closely fitted to Quill. The Attachment will give years of service before there is need of take-up which has been provided for by a solid shim running the total length of the housing. Travel of the Quill 3½". Dependable micrometer depth stop, graduated in thousandths. Positive Quill lock. Rack and Worm feed for drilling and boring. ½ H.P. 1150 R.P.M. Ball Bearing Motor. Spindle speeds 275-425-700-1050-2100 and 4250 R.P.M. The spindle has 6 splines and is driven by pulley mounted on separate ball bearings.**

**LET US tell you where a Bridgeport High Speed Milling Attachment may be seen in operation. Your time in viewing this equipment will be well spent.**

*Write for Illustrated Bulletin.*

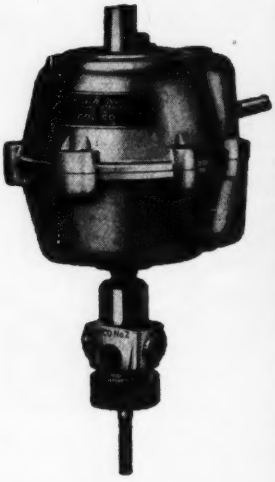
## BRIDGEPORT PATTERN & MODEL WORKS

**52 Remer St., Bridgeport, Conn.**

## Ettco-Emrich High Speed Tapping Attachment with Friction Drive

A high-speed tapping attachment with a sensitive friction clutch drive in which the power is regulated by pressure on the lever of the drilling machine, has been brought out by the Ettco Tool Co., 596 Johnson Ave., Brooklyn, N. Y. This tapping attachment is so designed that if the tap sticks or "bottoms", the clutch will slip. The automatic reverse speed is 1¾ times the tapping speed. An important feature of this attachment is that the tap idles in the right-hand direction while being advanced to the work and is therefore turning in the tapping direction when it contacts with the work.

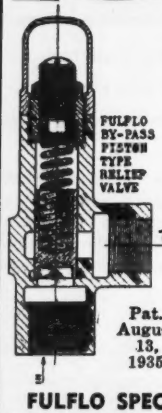
The main spindles are ball bearinged. Needle bearings are used in the idler gears. All gears are helical. The clutch consists of three segments of leather driving a cast iron cone. This design is made in two sizes for taps ranging from ⅛ in. up to ½ in. and completes a series of these attachments in seven sizes ranging from the smallest tap to the one-inch size. Workmanship is of the usual Ettco quality.



Ettco-Emrick Tapping Attachment with Friction Clutch Drive

TRADE MARK "FULFLO" REG U.S. PAT OFF

RELIEF VALVE

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Specifications
Made in pipe sizes ⅛" to 1¼". Five springs give ranges up to 350 Lbs. maximum.

Pat. August 13, 1935

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HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.

# Use APEX TIME-SAVING

# UNIVERSAL JOINT SOCKET WRENCHES and ADAPTERS

For tightening nuts and screws in hard-to-get-at places, Apex wrenches are real time and money saving tools on assembly operations.

Shanks are furnished to fit any size or type of electrical or air tool—also furnished with shanks to fit Yankee Screw Drivers for small assembly work. Sockets are furnished in any length, diameter and broaching to suit the job.

Operates at 35° angle—cannot lock at maximum angle. Tension type wrenches hold sockets in alignment with shank but allows full working angle. For setting nuts or screws in difficult places, this wrench cannot be equalled.

New sockets quickly assembled when old one wears out.

Noted for their long life and strength.

Apex Adapters, of the same design, are furnished with square or oval shank openings to fit all kinds of extension shanks.

Apex universal joint socket wrenches and adapters will reduce your assembly costs.

## THE APEX MACHINE & TOOL CO.

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555 East Third St.
Dayton, Ohio.

Mail me without cost your Apex Catalog No. 8 and full information about the tools I have checked below.

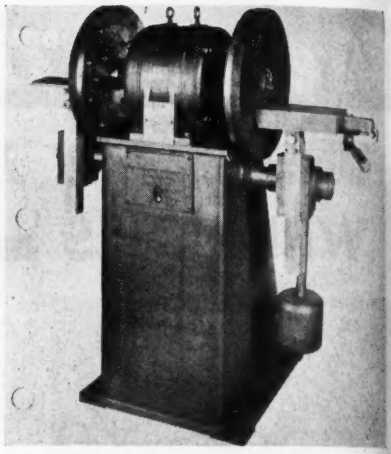
Name..... Street.....

City..... State.....

APEX TOOLS: .....Quick Change Drill Chucks, .....Morse Taper and Tap, Collets, .....Close Center Chucks, .....Positive Drive Chucks, .....Vertical Float Tapping Chucks, .....Safety Friction Tapping Chucks, .....Full Floating Tool Holders, .....Semi-Floating Tool Holders, .....Floating Tap Sleeves, .....Self Releasing Stud Setters, .....Universal Joints, .....Universal Joint Socket Wrenches, .....Screw Drivers, .....Micro-set Helical Expansion Reamers, .....Adjustable Blade Hand and Machine Reamers, .....“X-L” Improved Adjustable Blade Shell and Machine Reamers, .....Special Line Reamers.

## "Production" Type 302D Double Disc Grinder

The illustration shows a double disc grinder which has been developed by The Production Equipment Company, 5219 Chester Ave., Cleveland, Ohio. The grinder, which is to be known as the Type 302D, is built with a totally enclosed ball bearing motor and is furnished standard with steel disc wheels at each end and with one plain and one lever feed table. The lever feed table has angular adjustment and is supplied with ring wheels, lever tables or plain tables at both ends, or with standard

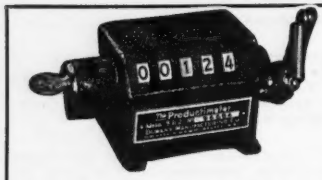


"Production" Type 302D—18-In. Double Disc Grinder

grinding attachment for one end and disc grinder at the other. The base is of heavy welded steel with large diameter rocker arms supported by heavy lugs. Starters are of the magnetic type and are located in the base with the push button located at the front of the machine. The machine is available in sizes from 10 inches to 30 inches.

## Hanson-Van Winkle-Munning Centrifugal Dryer

Hanson-Van Winkle-Munning Co. Matawan, N. J., is offering a centrifugal dryer, the features of which include compactness, efficiency and speed in drying basket loads of plated work. Available in two dryer shell sizes—12x12 in. and 18x18 in.—the unit is especially

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of men and equipment—
Eliminate costly overruns and underruns—

Speed up time study work—
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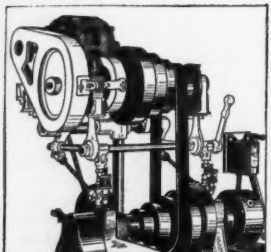

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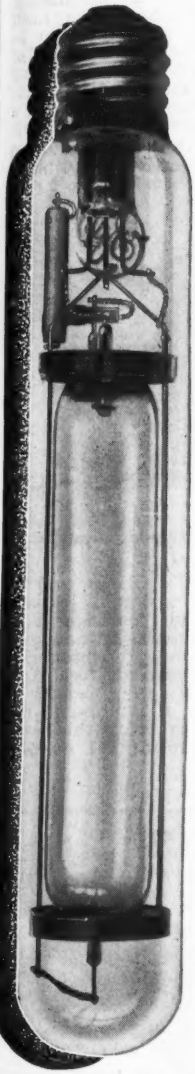
Don't be "hog tied" to a line shaft. Utilize "dead plant space." Motorize with Remco Drives. Your present machine tools equipped at surprisingly low cost. Drives changeable from one tool to another—not built special. Simple installation. Rigid! Complete line—from hack saws to 42" lathes. Write for FREE folder. Manley Products Corporation, State & Hay Sts., York, Penna.

REMCO MOTOR DRIVE



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# Double Your Productive Light

*Typical installation of General Electric Mercury Lamps in a well-known press shop. The high level of general illumination makes for accurate seeing.*

The 400-watt General Electric Mercury Lamp provides industry with almost double the efficiency of any other comparable light source. Long-lived, unaffected by vibration, this General Electric Mercury Lamp and its companion 250-watt lamp yield less heat per foot-candle than any other industrial illuminant. This factor is of great importance where high lighting levels with minimum extraneous heat are desirable. Psychologically, too, the light from these General Electric Mercury Lamps is cool and comfortable.

Both the 400-watt and the 250-watt lamps are adapted for use on either 115- or 230-volt lines. They have a rated life of 2,000 hours. For complete details on these lamps address the General Electric Vapor Lamp Company, 897 Adams Street, Hoboken, New Jersey, or any of the Sales Divisions of the Incandescent Lamp Department of the General Electric Company.

**GENERAL ELECTRIC**

741 H

General Electric Vapor Lamp Co.
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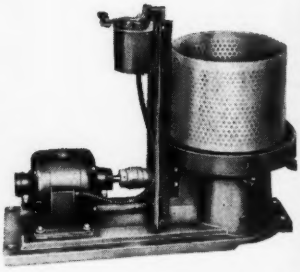
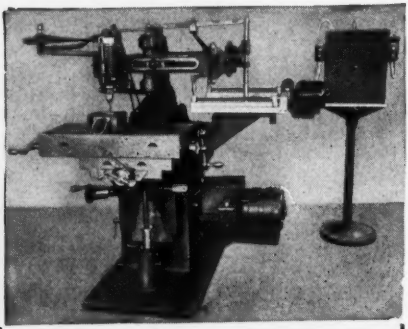
Incandescent Lamp Dept.
Nela Park, Cleveland, O.

recommended for use in conjunction with plating barrels since the small floor space required permits it to be placed close to the barrel. Transfer of the work is a simple operation and pieces to be dried may be placed directly in the perforated shell or in a separate basket which fits in the shell.

Power for driving the turntable at 600 r.p.m. is obtained from a ½ h.p. motor through a pair of bevel gears. Four roller bearings of ample size support the driveshaft and turntable without end play, reducing friction and vibration to a minimum. A conveniently located reversing switch allows the operator to control the direction of rotation at will. It is not necessary to bring the basket to a stop before operating the reversing control.



Hanson-Van Winkle-Munning Centrifugal Dryer

**Marquette Three Dimensional Universal Engraving Machine**

This new Diesinking and Profiling machine is specially designed for quickly and accurately cutting dies and molds in third dimensional direction as well as flat work, design pieces, lettering, profiling, etc. All motions are automatically controlled — also semi-automatic if desired.

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**Marquette Mechanical Eng. Co.**
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4346 Lake Park Ave., Chicago, Illinois

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**BALANCED - GRIP FILE AND TOOL HANDLES**
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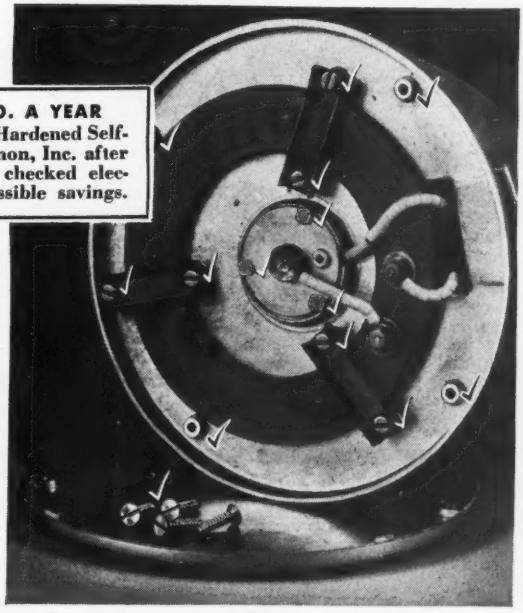
# "Brannon" calls in Parker-Kalon Assembly Engineer — SAVES 6¢ PER TEA KETTLE

**SAVING OF ABOUT $5000. A YEAR**
**through the use of Parker-Kalon Hardened Self-tapping Screws obtained by Brannon, Inc. after P-K Assembly Engineer Meader checked electric tea kettle assemblies for possible savings.**



IN attaching the electrical units and fastening the base to the cast aluminum "Brannon Hot-Water-Master", assembly difficulties were encountered which are common where machine screws are used in comparatively shallow and blind holes. Tap breakage was high . . . parts and material too frequently became damaged . . . assembly work had to be done carefully and slowly . . . fastenings lacked holding power, particularly after being removed and replaced a few times.

Many concerns "put-up-with" such troubles, feeling they are unavoidable. But Brannon, Incorporated invited Parker-Kalon Assembly Engineer Meader to go over the assemblies and see whether Parker-Kalon Hardened Self-tapping Screws could be used to eliminate the trouble and bring down costs. The result of Mr. Meader's call paid Brannon well for the effort. It was found that the Hardened Self-tapping Screws, easily substituted for the machine screws, would save from six to seven cents on each kettle, or about $5000. a year. Also, that the fastenings made this modern, simpler way, without tapping or any other ordinary difficulties, were actually stronger and unimpaired by repeated disassembly.

***Have a P-K Assembly Engineer make a study of your fastenings***

On your own metal or plastic fastenings the chances are 7 out of 10 that you could use the specialized knowledge of a Parker-Kalon Assembly Engineer to advantage. Your invitation will bring one of these practical men to consult with you and determine whether you are missing economies which Hardened Self-tapping Screws could effect. *Sold only through recognized distributors.*

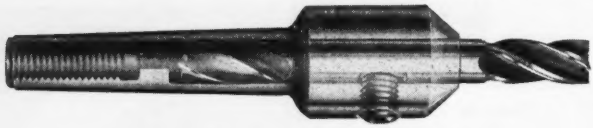
PARKER-KALON CORPORATION
Dept. M, 198 Varick St. New York, N. Y.

**PARKER-KALON *Modern* FASTENING DEVICES**

A HARDENED SELF-TAPPING SCREW FOR EVERY KIND OF ASSEMBLY

## Putnam High Speed End Mill Holder

The illustration shows a high speed end mill holder which is now being marketed by the Putnam Tool Co., 2981 Charlevoix Ave., Detroit, Mich. This holder is made with hole diameters of the required size for end mills with shank diameters from 3/16 to 1 in. inclusive. A holder with any particular hole diameter will hold either single-end or double-end mills with corresponding shank diameters. End mills are accurately held in this style holder by a set screw which rests snugly into a flat on the mill shank. Locked in the holder in this manner, the end mill cannot possibly come out nor can chips work in between the mill shank and the holder. This arrangement also makes it a simple matter to change end mills.



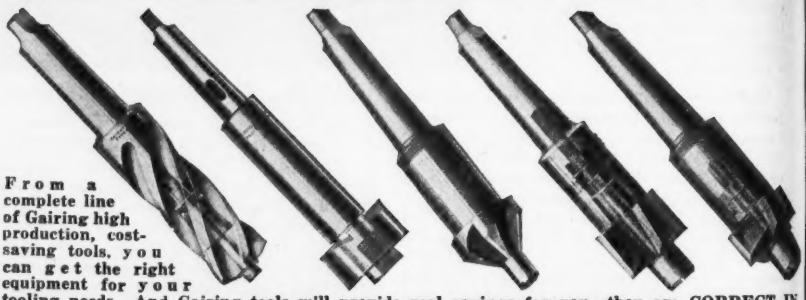
Putnam High Speed End Mill Holder

## Ames Shockless Gage No. 56

A dial gage especially designed to withstand the rigors of more or less continuous operation on inspection work in high production plants, to be known as the "Ames Shockless" dial gage, has been brought out by B. C. Ames Co., Waltham, Mass. The gage is made in two sizes; No. 56 and No. 57, the No. 56 being 2¼-in. diameter with a maximum spindle travel of 3 in. The No. 57 gage is of the same construction, but the diameter is 3⅝ inches.

The Ames Shockless gage is said to be entirely new in design, performance and appearance. The lower half of the spindle serves as the contact point to bear against the workpiece. The end of the spindle is hardened to resist wear, there is no thread to break off or shoulder to catch onto the work and the spindle is very inexpensive to replace. The gage stem can easily be unscrewed from the case, the lower half of the spindle with-

GAIRING COST-SAVING TOOLS



From a complete line of Gairing high production, cost-saving tools, you can get the right equipment for your tooling needs. And Gairing tools will provide real savings for you—they are CORRECT IN DESIGN, ACCURATELY MADE, UNIFORM AS TO HARDNESS, AND LONGER IN LIFE. Our engineers are always ready to make authoritative recommendations on your tooling problems . . . no obligation.

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THE GAIRING TOOL CO.

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**Easily—Quickly—Without Injury To the Threads**

**The Walton Tap Extractor** is a device for removing taps broken at or below the surface of the work—easily—quickly—and without injury to the threads.

Made in 2, 3, and 4 fluted styles in all standard sizes from No. 4 to 1½ inch. Let us prove its value to you by a 60-day free trial.

**The Walton Co.**
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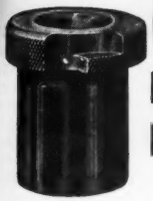

# COLONIAL DRILL JIG BUSHINGS

A. S. A. STANDARD

You are sure of getting accurate and dependable drill jig bushings when you order COLONIAL. Made of High Grade Tool Steel. And when you order COLONIAL, you'll get them quickly.

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# Driver Portable Heavy Duty Flexible Shaft

**PR102**
Complete with ½ H. P. Capacitor Type Motor
**$62.50**

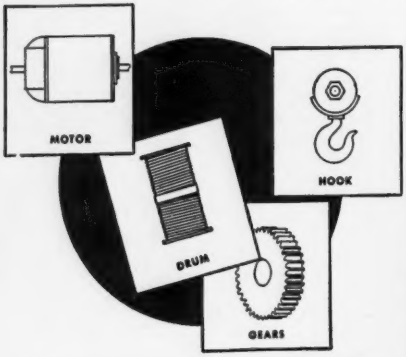
Write Dept. MS9 for fully illustrated folder.

Here is a real portable machine built for long, hard use. Equipped with SKF ball bearings for smooth, quiet operation. Does innumerable jobs—sanding, grinding, drilling, cleaning, buffing, rotary filing, reaming and many other operations. It has a telescoping type stand, giving 15" additional height. Height normal position 42", raised 57". Motor swivels and locks in any position. Motor and yoke is detachable for overhead suspension. Large base holds tools. Has large, heavy duty S K F ball bearing hand piece with ½" spindle. Casing is rubber covered.

*All Types of Flexible Shafts Made to Specification.*

**Walker-Turner Co., Inc.**
Plainfield New Jersey

UNCOVER THE FACTS!

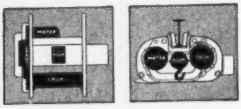



Together They Spell

S·I·M·P·L·I·C·I·T·Y

The four principal parts of a hoist are the motor, drum, hook and gearing. Rearrange them in your mind; see whether you can group them into simpler, more logical design than the LO-HED hoist.

HERE'S THE WAY WE DO IT—



TOP VIEW END VIEW

If you were given the job of designing a hoist, we believe you, too, would do it the LO-HED way.

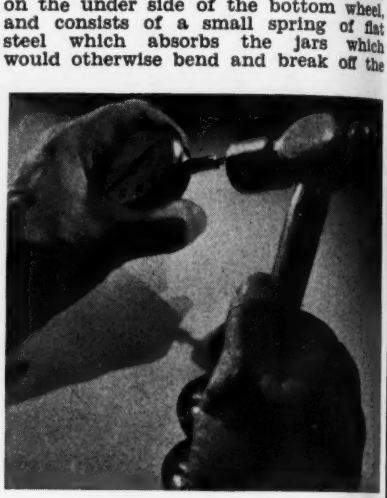
Division:
AMERICAN ENGINEERING COMPANY
2451 Aramingo Ave., Philadelphia

AECO LO-HED Hoist

Other Products—Taylor Stokers, Hele-Shaw Pumps, Motors and Transmissions, AECO Marine Auxiliaries.


drawn for cleaning and the assembly replaced without otherwise disturbing the gage. This construction eliminates the necessity of completely tearing down the gage in order to clean it.

An outstanding feature of the gage is the shock absorber which is located on the under side of the bottom wheel, and consists of a small spring of flat steel which absorbs the jars which would otherwise bend and break off the



Ames Shockless Gage No. 56

gear teeth. The bottom wheel with shock absorber attached is staked loosely to the staff and the driver is staked solidly. When the gage spindle is struck a quick blow, as indicted in the illustration, the spindle actually moves ahead of the wheels, and they later catch up with it. The action is instantaneous but sufficient to save all parts of the gage from breakage.

The Ames Shockless gages are made with jewel bearings or plain bearings.


SpeedWay

PROVEN PERFORMANCE ENDS TOOL GAMBLE

Proven types. Established principles of design; crash-proof steel bodies (lighter), cooled motors, overpowered (will not stall), 12 features that mean more holes and longer, trouble-proof service. A full line to pick from.

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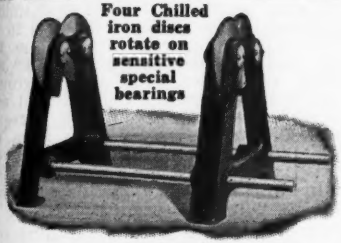
Speedway Mfg. Company
1825 S. 52nd Ave. Cicero, Ill.

Anderson Improved
**Balancing Ways**
*No Leveling Required*

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

| Swing | Greatest Distance Between Standards | Capacity in lbs. |
|---|---|---|
| 20 in. | 20 in. | 1,000 |
| 40 in. | 30 in. | 2,000 |
| 60 in. | 30 in. | 2,000 |
| 72 in. | 66 in. | 5,000 |
| 96 in. | 88 in. | 10,000 |



Four Chilled iron discs rotate on sensitive special bearings

*Write for Full Information*

Mfd. By **Anderson Bros. Mfg. Co.**

*1926 Kishwaukee St., Rockford, Ill.*



**4 Holes at Once**

**With a U. S. Multiple Drill Head**

● You can save money and time with U. S. Multiple Drill Heads, standard or special according to the job.

This head is for drilling 4 holes at once . . . with other U. S. heads as many as 50 holes can be drilled at one time.

Send blue prints for estimates.

**The United States Drill Head Co.**

1954 Riverside Drive
CINCINNATI, OHIO



**DO IT—*Better--Faster for Less!***

with

**ODIN UNIVERSAL PRECISION VISES**

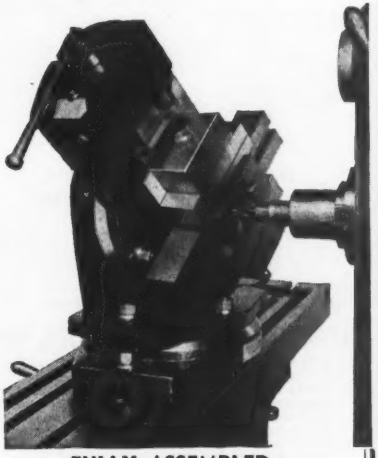
**They quickly pay their cost in savings on High Tool Costs — Expensive Fixtures — Patterns and Castings —Extra Set-Ups**

ODIN Vises have interchangeable Jaws, Hardened Ground Parallels, and provide positive clamping at every angle and degree. They are constructed of drop forgings and semi-steel castings and are furnished with Horizontal and Vertical Bases indexed 180°. All parts are interchangeable and all handles are removable. They can be used in part or fully assembled.

ODIN UNIVERSAL CORPORATION
CHICAGO

Sales Division
110 S. Dearborn St.

Telephone
Franklin 3281



**FULLY ASSEMBLED**

Investigate the money saving possibilities of ODIN VISES. Write today for full facts and prices.

In the jeweled gages, all staff pivots, including those of the center pinion, are jeweled with genuine sapphires that are unusually large and thick. The jewels are set into bronze rings which are pressed into tapered holes in the gage plate and wheel support. The purpose of the jeweled bearings is to eliminate friction and wear in the pivot holes.

The hands used on the Ames Shockless gage are unusually heavy, which is possible because the shock absorber cushions the abrupt action which would otherwise loosen them on the center shafts. The hands will neither break off nor loosen even under most severe service, and are balanced so that they do not affect the spindle action. An unbreakable crystal is provided which can be pushed back through the bezel and out with the fingers, and is replaced by pressing it back into the bezel, also with the fingers. The bezel is smaller in diameter than the crystal which causes the crystal to dome and prevents its falling out. The back is of solid steel in one piece, with a clamp lug that will not break off. The case is machined from thick section brass tubing, recessed for the back and plate, threaded for case stem, polished and chromium plated.

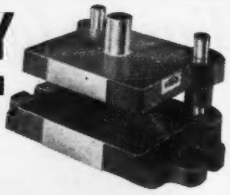
## Oliver Self-Contained Belt Grinder and Polisher

A horizontal belt grinding and polishing machine especially designed for the grinding and polishing of bronze tablets, aluminum castings, brass castings, and so on, has been brought out by Oliver Machinery Company, Grand Rapids, Mich. The machine is compact and self-contained and has the features of convenience and efficiency in handling work within its capacity. Flat work such as bronze tablets and similar workpieces up to 46 in. long and 26 in. wide can be supported directly on the table and ground or polished at one setting, and wider work can be ground or polished by setting the material over on the table. The table will lower so as to allow a height of 9 in. from the top of the table to the bottom of the top belt. Grinding and polishing belts of any width up to 5 in. may be used, but 4-in. belts are recommended.

The main frame of the machine consists of two end castings with a cross girt frame casting securely bolted to provide a rigid base for supporting the other parts of the machine.

The table is 33 in. wide by 44 in.


DANLY
PRECISION
DIE
SETS



Danly All-Steel Sets
Danly Commercial Sets
Danly Die Makers' Supplies

DANLY SERVICE

7 Danly Warehouses Provide
24-Hour Service for 85% of
All Metal Fabricating Plants

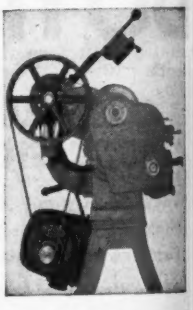
DANLY MACHINE SPECIALTIES, INC.
2122 South 52nd Avenue, Chicago, Ill.

Long Island City, N.Y., 36-12 34th Street
Dayton, Ohio, 114-116 N. St. Clair Street
Detroit, Michigan, 1549 Temple Avenue
Rochester, N. Y., 16 Commercial Street
Cleveland, Ohio, 1444 East 49th Street
Philadelphia, Pa., 3913 North Broad Street

DANLY DIE MAKERS' SUPPLIES



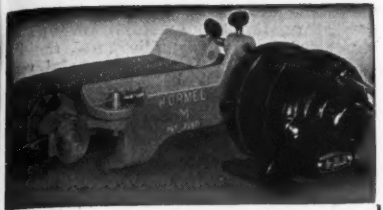
Sebastian
Motor Drive
Attachment
For
Cone Head
Lathes



● For any make of lathe from 8" to 20" swing. Does not obscure vision. Easy to attach—low in price.

12" SIZE.....$55.00
16" SIZE..... 63.00
20" SIZE..... 90.00

The Sebastian Lathe Co.
CINCINNATI, O. U. S. A.



• NEW An Inexpensive ABRASIVE BAND GRINDER . . .

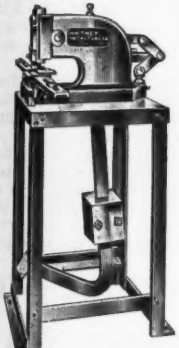
*"Built Like a Machine Tool"*

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION, complete with grease gun.

*Write for illustrated folder on this and other styles and sizes.*

**HORMEL-M GRINDER**
WALLS SALES CORP.
96 WARREN ST. NEW YORK, N. Y.

Foot Press No. 28



Capacity 2" hole in 16 gauge — 100 holes per minute.

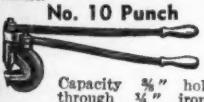
Angle Iron Shear No. 4

Capacity 2x2x¼" Angle Iron Weight 44 lbs.

ASK FOR CATALOG No. 10

•

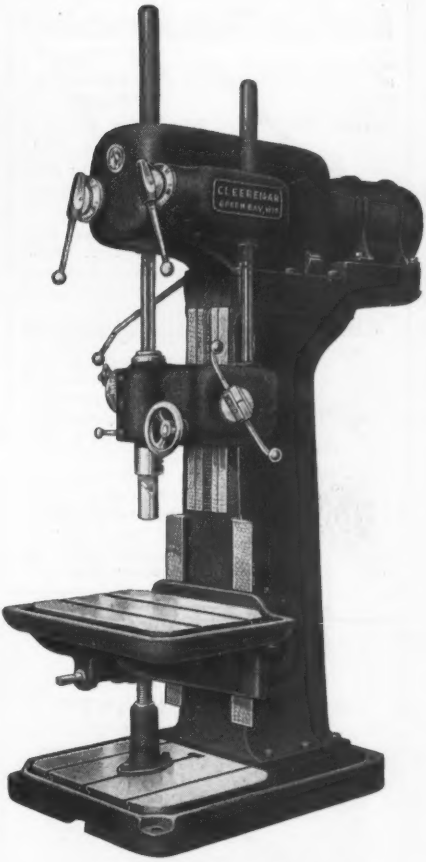
No. 10 Punch



Capacity ⅜" hole through ¼" iron. Weight 8¼ lbs.

80 ITEMS FROM WHICH TO CHOOSE

**WHITNEY METAL TOOL CO.**
91 FORBES ST. ROCKFORD, ILL.



**CLEEREMAN DRILLING MACHINES**

• Sliding Head or Stationary—Round or Square Columns—Fully Geared—Anti Friction—Finest Automatic Oiling—The Newest Drilling Machine On The Market And The Outgrowth of More than 20 Years' Experience In Building Drilling Machinery.

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**THE CLEEREMAN MACHINE TOOL CO.**
GREEN BAY • WIS.

**Surface Temperatures**

Flat Stationary or Moving Curved Surfaces

The "Alnor" Combination Pyrocon

Ideal for rolls, molds, plates, platens and plastic material temperatures.

Write for bulletin.

**Illinois Testing Laboratories, Inc.**
146 W. Austin Ave. Chicago, Illinois

**"American" Amplifying Gauges**

A rugged production tool for the rapid inspection of parts to close tolerances. Widely used in the automotive and other high production fields.

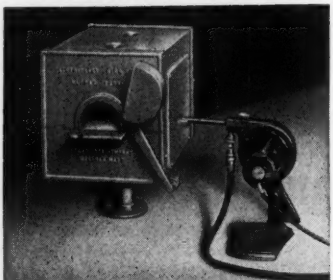
Write for bulletin with new low prices on standard and special adaptations to suit your work.

**The American Gauge Co.**
Dayton, Ohio

**"Stark"**

**"ELECTROBLAST"**

High Speed Heat in 20 Minutes



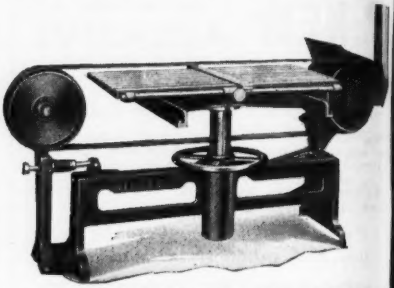
Powerful torch used separately as a very handy portable flame, $35. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3⅛"x2½". $35. Also a larger furnace with built-in torch, muffles 7"x4⅝"x3½".

**STARK TOOL CO.**

Originators of the American Bench Lathe
Est. 1862 WALTHAM, MASS.

long. It runs on ball bearing rollers operating on machined ways with positive stops for the extreme forward and backward positions. The total travel of the table is 29 in. and the total vertical adjustment is 9 in. The table is supported by a 4-in. diameter screw with an 18-in. handwheel for vertical adjustment.

The abrasive belt pulleys are 14 in. in diameter with 4-in. face and are made of aluminum, carefully balanced, and faced with rubber tire. The idler



**Oliver Self-Contained Belt Grinder and Polisher**

pulley runs on ball bearings and is provided with automatic spring take-up for the belt and micrometer screw adjustment for tracking the belt. Abrasive belts from 13 ft., 8 in. to 14 ft., 8 in. long may be used although a belt length of 14 ft., 6 in. and 4 in. width is recommended.

A suitable enclosing dust hood is furnished over the driving pulley, fitted with suitable connection pipe leading to the dust collecting system.

Power is provided by a 2 h. p., ball bearing, totally enclosed air jacket 1800 r.p.m., 3 phase, 60 cycle, 220 or 440 volt motor mounted directly on the frame of the machine. The motor is fitted with a special safety first switch.

**MILLING MACHINE VISE**

SEND FOR FOLDER

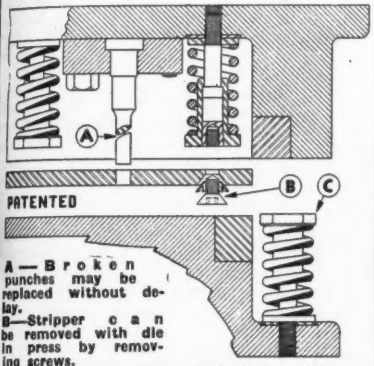
Width of Jaws 6" POWERFUL
Depth of Jaws 1½" ACCURATE
Jaw opens 4"

Jaws are tool steel, hardened and ground. Circular base graduated in degrees.

**DURO TOOL CO.**
20th & South Sts. Phila., Pa.

# STRIPPIT

The most dependable and economical stripping device made.




PATENTED

A—Broken punches may be replaced without delay.
B—Stripper can be removed with die in press by removing screws.
C—No stripper plate required for stripping scrap — strippits alone will strip it.

Write for catalog.

**THE STRIPPIT CORPORATION**

1559 Niagara St. Buffalo, N. Y.

Also Wales Adjustable Hole Punching Dies.

# NEAT STAMPING IN NAME PLATES

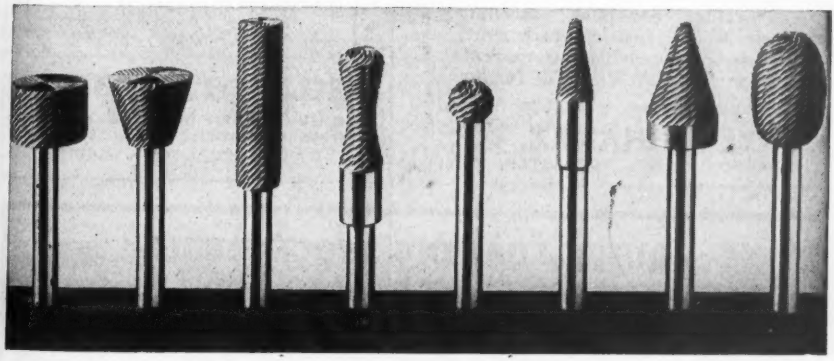
This machine quickly stamps details and serial numbers into name plates.

*Write For Particulars*

**GEO. T. SCHMIDT, Inc.**

1806 Belle Plaine Ave., Chicago, Ill.

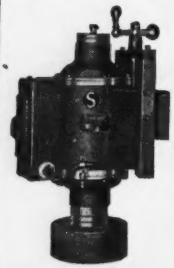
# FORD HAND CUT ROTARY FILES



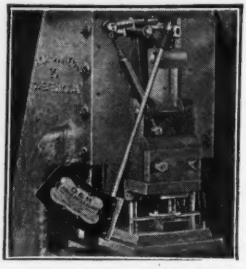
Just a few of the many standard shapes which are carried in stock.
Write for full information.

## M. A. FORD MFG. CO.

108 Harrison Street Davenport, Iowa



**STANDARD**
**VERTICAL ANGLE PLATE GRINDER**
For Planer, Boring Mill, etc., 2 H.P. to 10 H.P. sizes.
Tool Post and Angle Plate Grinders for Lathes, etc. Write for complete catalog showing Electric Drills, Heavy Duty Grinders, Disc Grinders, Buffing and Polishing Lathes.
THE STANDARD ELECTRICAL TOOL CO.
8th & Evans Sts.
Cincinnati, Ohio



**Accidents Cost Money**

● One wrong move by a punch press operator may result in the loss of a hand for life. Reduce the accident hazard by installing D. & M. Automatic Punch Press Guards. Dependable, economical, easy to install. Write for further details.

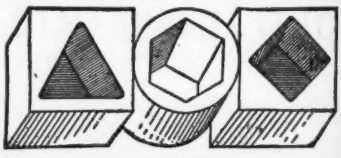
**TAYLOR-SHANTZ, Inc.**
4 COMMERCIAL ST., ROCHESTER, N. Y.

Equipment includes the motor, switch, dust hood and pipe connection, one belt 4 in. wide and one polishing pad 9 in. long by 4 in. wide. Floor space required, 7 ft., 2 in. by 3 ft., 8 in.

## Starrett No. 567 V-Block and Clamp

A V-Block and Clamp with several important features that broaden its use for both production and inspection work has recently been added to the line of fine tools manufactured by The L. S. Starrett Company of Athol, Mass. The block is made of steel, hardened and ground. The sides are ground parallel and the V-grooves are ground central and parallel to the sides and base.

A forged clamp, which holds cylindrical stock in the V-grooves, has an adjustable support to keep the block from tilting while it rests on its side. One end of the block is stepped down. It has a V-groove and slots at right angles to the base in which the clamp can hold shoulder studs, round pins, etc., for light milling, drilling and grinding. Hole clearance is provided for drilling and removing dowel pins and four $\frac{3}{8}$-in. x 16-thd. tapped holes, two in the base and



**DRILL THESE HOLES**
**By a Quick, Easy, Inexpensive Method**
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Pa.

**QUICK-LOADING STOCK REELS**

SINGLE AND DOUBLE

For use with automatic machines and punch presses with feeds. **Also reels for wire.**

S&S **S & S MACHINE WORKS** S&S
4541 W. LAKE STREET . . . CHICAGO, ILLINOIS

# *Built for* LONG WEAR

**Millers Falls Steel Letters and Figures are built for long wear and hard service. Whatever the marking job—numbering wood or metal patterns, engine blocks, machinery, tools—their accurately formed, deeply relieved faces make a sharp, clean "bite" that remains as a permanent identification.**

**Available in two types—guaranteed Hand Cut Gothic Face—Machine Made Roman Face.**

**Ask your tool dealer to show you a set or write us for circular. You'll also be interested in the Millers Falls fine tools illustrated and described in Catalog 41—drills, grinding heads, micrometers, lathes and accessories, and many other items. Catalog 41 is free on request.**

**Millers Falls Company**

Greenfield MILLERS FALLS TOOLS SINCE 1868 Massachusetts

# HANDEE TOOL OF 1001 USES!

GRINDS
CARVES
POLISHES
ENGRAVES
DRILLS
SAWS

DeLuxe Model
**$18.50** POSTPAID
6 Accessories FREE

● Unmatched performance—a sensation wherever used, in experimental laboratory, model and tool room, on the production line in large and small plants—making, shaping, polishing all metal products, alloys, glass, composition materials, wood, stone, etc.

Use this amazing tool for difficult precision jobs and hard-to-get-at places on intricate machine parts without removing the parts or dismantling machine. 200 different accessories available.

Fastest and most powerful tool for its type and weight ever developed. 25,000 r.p.m. Weight 12 ounces. Almost human in its smooth, rapid response. Try a Handee! Test for yourself its marvelous efficiency.

*Order Today on 10 Days Trial or Send for Catalog*

**CHICAGO WHEEL & MFG. CO.**
1101 W. MONROE ST., DEPT. 00
CHICAGO, ILL.

☐ Send Catalog M. M. S. — 6
☐ Send De Luxe Handee on 10-Day Trial

*Name*_____

*Address*_____

*City*_____ *State*_____

**2, 3 & 4-way VALVES**

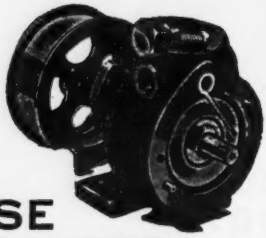
For use on air, water, steam or oil for operating single and double acting cylinders, on pressures up to 5000 lbs. Made in Lever, Foot and Solenoid and Motor Operated types

*Bulletins on request*

**W. H. NICHOLSON & CO.**
136 Oregon St., Wilkes-Barre, Pa.



The Rollway Pump



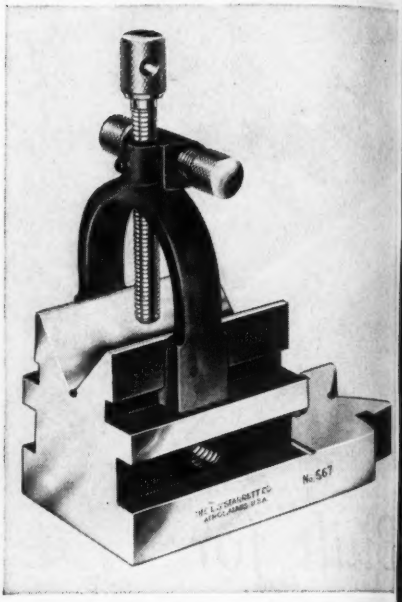
**NO PAUSE ON REVERSAL**

The Rollway Reversing Models reverse automatically and cutting tools are not robbed momentarily of coolant. This is the only pump maintaining a vacuum sufficiently high to operate valves fast enough to avoid a pause in flow on reversing.

**Send for Data Sheet.**

Engineering Data Sheet embodies complete specifications of Reversing and Non-Reversing Models.

**PIONEER**
ENGINEERING & MFG. CO.
33 Melborn Ave. Detroit, Michigan
Also Centrifugal and Hydraulic Pumps

Starrett No. 567 V-Block and Clamp

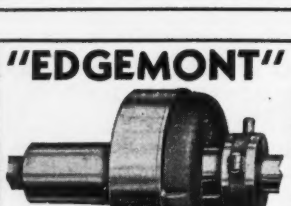
one on each side, permit securing the block to a face plate or angle iron.

The block is commercially accurate and makes an excellent support for duplicate cylindrical parts being inspected with a dial indicator. It is approximately 1⅞ in. square, with a base length of about 3⅝ in. and a capacity of 1⅞ inches.

## Eisler Press-Type Electric Resistance Welding Machine

The Eisler Engineering Co., 750 So. 13th St., Newark, N. J., announces the

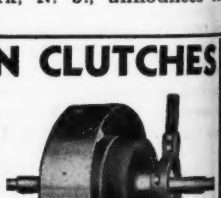

**"EDGEMONT"** SERVICE TESTED **FRICTION CLUTCHES**



**EXPANDING "TYPE B"**

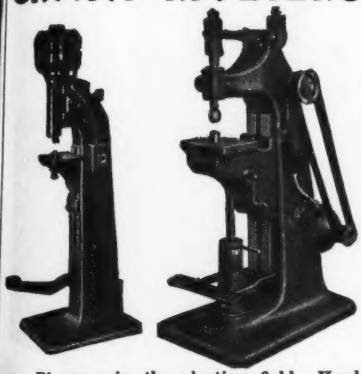
Every factory has clutch jobs where the Edgemont "Type B" is the ideal clutch. For countershaft, line-shaft, and many other applications, this clutch will do the work with utmost satisfaction.

Catalogue sent on request.



**The Edgemont Machine Co**
2100 HOME AVE. DAYTON, OHIO

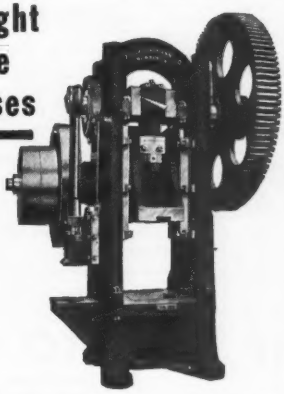
## GRANT RIVETERS



● Pioneers in the riveting field. Head rivets from smallest to ⅝" diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.
Write for literature—and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
96 Silliman Avenue Bridgeport, Conn.

## Straight side Presses



Outstanding in every detail for heavy blanking and forming work. All stresses are taken centrally.
Write for new catalog illustrating and describing this and other presses.

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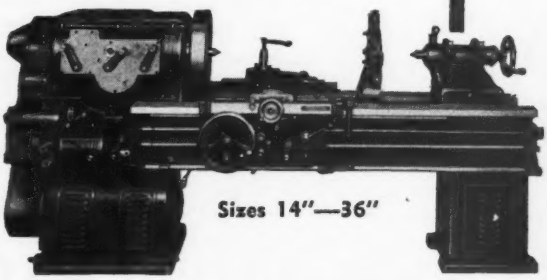
184 Vanderpool St. Newark, N. J.

## SIDNEY 12-SPEED SLIDING GEAR-HEAD LATHE

offers these outstanding features:

12 speeds through spur tooth gears.
Speeds selected by engaging the gears.
Automatic lubrication in the headstock, apron, carriage cross slide, and carriage bearings on the bed ways.
All steel parts of best grade alloy steel forgings, heat treated to maximum tensile strength.
Anti-friction bearings throughout all units.



Sizes 14"—36"

Headstock shafts mounted on TIMKEN bearings. Beds of semi-steel (approx. 80% steel) with Brinell hardness of not less than 235.

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210 Highland Ave. Sidney, Ohio

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**HANDY RACKS**

Save time and steps by keeping your bar stock, pipe, shafting, etc., on these HANDY RACKS along-side the operator. Keep stock neatly piled and assorted — instantly available—can be checked at a glance. Shipped on approval. Write for details.

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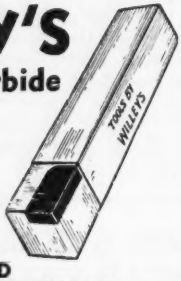
**Tungsten Carbide Tipped Tools**




. . . because of their uniform high quality and dependable long life. Your order shipped immediately from our complete stock.

**SEND FOR CATALOG** containing full information.

**ALSO** write for circular on improved type wheel dressing tool that will reduce your costs.

**Willey's Carbide Tool Co.**

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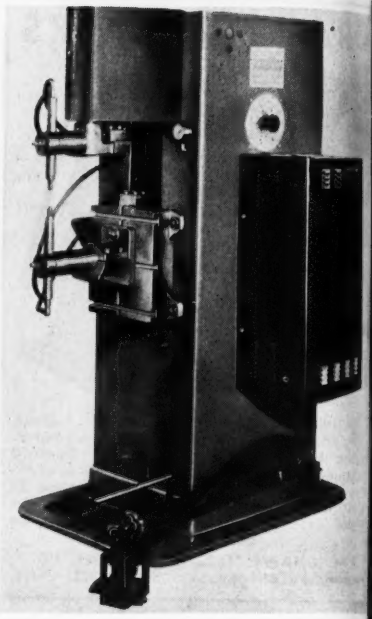
Representatives in all principal cities.

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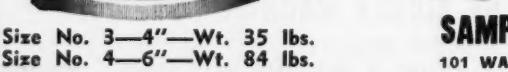
large press-type electric resistance welding machines.

Press-type welders are available up to 250 K. V. A. and can be supplied in foot, motor or air operated models. These machines are intended for handling various thicknesses of metal and are made in throat depths from 16 inches up to 48 inches. They may be had with speed changes ranging from 30 to 100 welds per minute.

Perhaps one of the features most important to the manufacturer is that the


**SAMPSON MILLING MACHINE VISE**



A strong, accurate vise, constructed of finest materials thruout . . . ideal for heavy duty work. Hardened steel jaws . . . extra large seating area of base provides utmost rigidity.

Ask for Complete Catalog of Sampson Tools.

Size No. 3—4"—Wt. 35 lbs.
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STANDARD
DRILL BUSHINGS

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LOWEST COST
LONGEST LIFE
EASILY REPLACEABLE

THERE'S A SIZE FOR
EVERY REQUIREMENT

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Hollow boring is our business. We specialize in it. Our experience and facilities enable us to quickly turn out hollow bored parts which exactly meet all specifications.

That is why so many prominent machine tool builders and other manufacturers come to us for hollow boring service.

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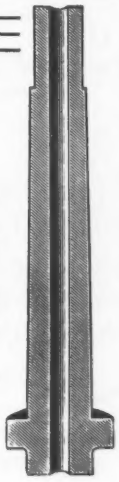

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2000 Raspberry St.
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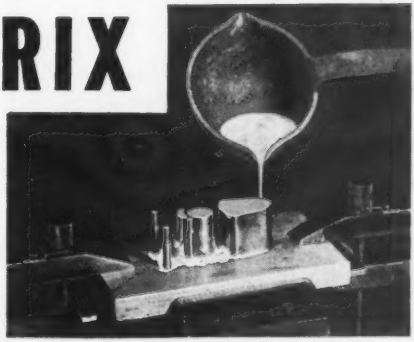
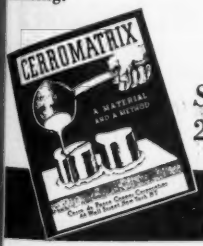
CERROMATRIX

A fast, accurate method of mounting die parts without machining non-working surfaces to close dimensions. Dies constructed with Cerromatrix outwear those assembled with screws and dowels—reduces cost, time and uncertainty of die making.



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B·S

welder is a self-contained unit, consisting of the timer, contractor and switch, all assembled in the welder. With this welder the operator has all the welding accessories handy, resulting in more efficient operation and economy of time.

## Landis Stationary Pipe Die Head

The line of Landis Stationary Die Heads made by the Landis Machine Company, Inc., Waynesboro, Pa., has been augmented by the addition of a 10-in. head. The 10-in. head is made in two models; the standard die head for standard pipe threads, and a heavier model for oil country tubular goods. The capacity of the standard head is 4 to 10 in. in standard pipe threads and the head for oil production work is from 4½-in. to 10¾-in. O.D. thread.

The standard die head is fitted with 2¾ in. wide chasers and will cut all standard pipe thread lengths within its range. The heavier model of the 10-in. head can be fitted with 3-11/16 in. wide chasers for a maximum thread length of 3-5/16 in. or with chasers 4⅜ in. wide for all thread lengths up to and including 4-3/16 inches.

The die heads are manually operated and are locked when closed. Universal

STEEL BENCH LEGS
For Factory & Shop

Sturdy ALL-STEEL construction, well braced and welded thruout. Painted Moss Green. Height Overall 29". Width Overall 26". Top and bottom rail punched to take a 12" plank. Also special built bench legs.

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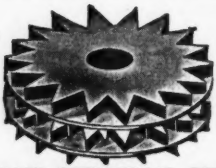
We make all types of Dressers and Cutters



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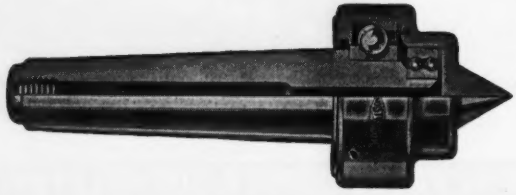

It turns with the work. Eliminates friction of dead center.
Lowest possible overhang prevents vibration and chatter.
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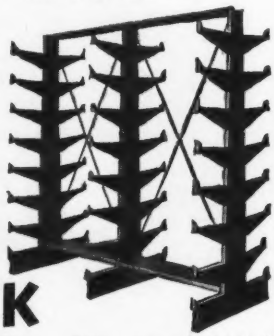

BAR RACK

79-5/16" High, 72" Long, 31½" Deep—other lengths available.

Pipe, rods, bars waste space and time when piled on floors or in corners. Lyon Bar Rack holds large variety long or short parts and makes them quickly accessible. Arms adjustable. Send for descriptive bulletin, or order direct.

LYON METAL PRODUCTS, INCORPORATED Aurora, Illinois

Columbia TOOL STEEL

Users of Columbia Tool Steel now exceed their peak 1929 purchases by more than 25%.

Added production facilities enable new standards of service as well as material.

It pays to use Good tool steel.

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THE CHARGE OF THE CUPOLA BRIGADE!

"Theirs not to reason why"—if you want to pay wheelbarrow men to charge a cupola, there's nothing to stop you. But it will cost you plenty. So will some of the other old-fashioned methods.

A P&H cupola-charging hoist can do more work and cost you far less. A trailing cage unit, for example, with motor-driven trolley is fast, efficient and economical in cupola charging service.

P&H material handling engineers have a wealth of experience to answer your problems. Why not call one in? Or ask us to send you Bulletin RH-2.

*Safety catches, which ride above I-beam flange, make it impossible to derail this unit should a heavy jolt occur. It's 100% safe.*

HARNISCHFEGER CORPORATION
ESTABLISHED 1884
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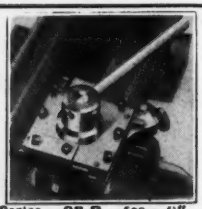

Series 9S-B for 9" South Bend, Stark No. 41 or other lathes of same size.
Write today — advise make and size lathe.

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4 indexing positions—tools mounted direct on square turret. Series 9S-B without tools, $15 — with 4 tools, boring bar and cutting-off tool, $16.80 f. o. b.

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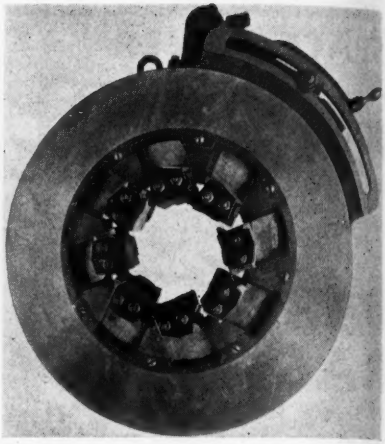


**Landis Stationary Pipe Die Head**

adjustment for size is provided. The heavier model of the 10-in. die head is fitted with chaser holders which have independent adjustment to and from the centers. This type of chaser holder, which insures an equal distribution of the cut, is now supplied with all Landis Stationary Pipe Die Heads in which 3-11/16 in. and 4-⅜ in. wide chasers are employed.

The new die head, like the rest of the line, is built for hard service. Its sturdy construction provides a rigid support for the chasers and insures accurate and well-formed threads. The head is applicable either to Landis Pipe Threading and Cutting Machines or machines of other makes having sufficient clearance.

## Continental Model JXD Doall

In response to the demand for a sawing machine with an extra deep throat

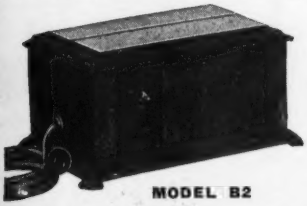
7½ in. Rotary Table for Small Miller Tables.
Send for circular.

**STEVENS ROTARY TABLE**

**Table graduated for single degree reading and worm shaft collar for readings in single minutes. Worm can be disengaged for turning table by hand.**
**Vertical lock pin provided for direct indexing of 2, 3, 4, 6, 8, 12 and 24 divisions. Other sizes 12" and 18" diameters.**

**JOHN B. STEVENS INC.**
306 HUDSON ST. NEW YORK, N. Y.

## NEW L-W DEMAGNETIZERS



MODEL B2

To meet the demand for a Demagnetizer that would properly fill the requirements of taking the magnetism out of the work that has become magnetized through induction, we have designed and built two models for large and small work. A single pass over the stationary poles is sufficient to demagnetize the work completely.

**MODEL B2**

**Size: 7¾" wide, 12" long, 6¾" high**
Complete with pilot light, switch and cord ready for use—operates on 110 volt alternating current. **PRICE $65.00**

**MODEL J1**

**Size: 7¼" wide, 7¼" long, 6¾" high**
Complete with switch and cord ready for use—operates on 110 volt alternating current. **PRICE $45.00**

Write for circular.

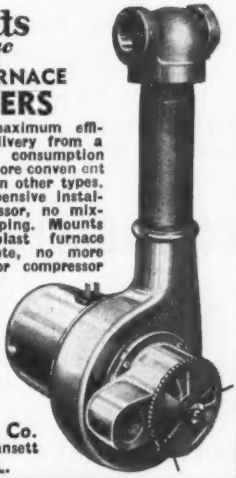
**L-W CHUCK CO.**
NO. 1-7 N. ST. CLAIR ST. TOLEDO, OHIO

**For All Heat Treating—Use Gas Heat**

● For Smelting, Refining, Hardening, Test Kilns, Pottery Burning, Glass Melting, Etc.

The Clements Cadillac

**BLAST FURNACE BLOWERS**



● Designed for maximum efficiency in heat delivery from a gas and power consumption stand-point, it is more convenient and economical than other types.
● Requires no expensive installation—no compressor, no mixing tank, no air piping. Mounts directly under blast furnace and costs, complete, no more than the motor or compressor alone required with other types equal to the same high-heating job.

Two models: Heavy Duty and General Duty.

For Details Write to

**Clements Mfg. Co.**
6655 S. Narragansett
CHICAGO, ILL.

## NEVER BEFORE SUCH QUALITY in the LOW PRICE DRILL FIELD!

Built by SKILSAW

½ inch DEFENDER **$35.00**

## DEFENDER DRILLS

**Compact—Light Weight—Easy to Handle**

Never before have you seen such quality construction and engineering in low priced drills. Bearings are ball and self-lubricating Oilite bronze. Motor has extra overload capacity for cool running and longer life. Special alloy-steel gears are helically cut for quiet operation. Die-cast alloy frames for strength and lightness. There is no greater drill "buy" on the market!

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¼ inch DEFENDER **$19.50**

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**GEARS**
**Good Gears Only**
**All Kinds**
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**LOCK-NUTS**
**NUT-LOCKS**
**for every use**
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**COLUMBIA NUT & BOLT CO., Inc**
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**The New Stackbin Section**
Patented

**MAKES A STOCKROOM AS EASY TO BUILD AS A SECTIONAL BOOKCASE**

The Stackbin Section is designed so that one-section-nests-into-the-other, and sections nest deeply enough so that several placed one on top of the other provides a substantial unit. Ideal for temporary stockrooms near the job. Base separate. Counter top can be supplied. Write for circular and prices.

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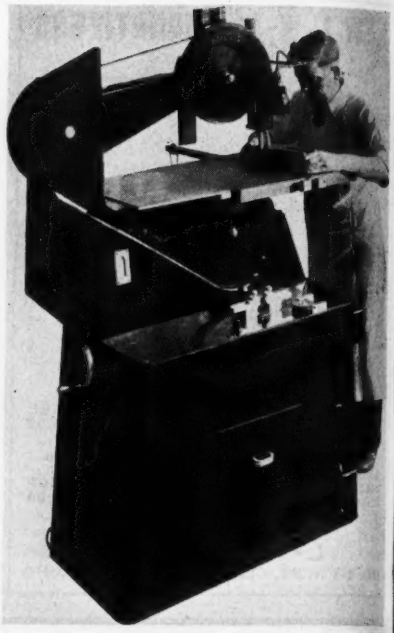
**TROY ST. PROVIDENCE, R. I.**

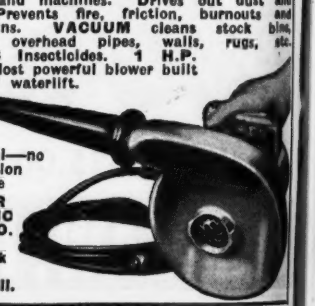


**Continental Model JXD Doall**

capacity, Continental Machine Specialties, Inc., 1301 S. Washington Ave., Minneapolis, Minn., has brought out the Model JXD Doall shown in the illustration. This machine has all the features of combination band sawing and filing for internal and external work that are incorporated in the other Doall models.

The machine is of the usual Doall sturdy construction. The table area is

**BREUER'S BALL BEARING TORNADO PORTABLE ELECTRIC BLOWER**
**BLOWS** powerful 275 M.P.H. blast of air into motors and machines. Drives out dust and dirt. Prevents fire, friction, burnouts and shut-downs. **VACUUM** cleans stock bins, shelves, overhead pipes, walls, rugs, etc. **SPRAYS** Insecticides. 1 H.P. motor. Most powerful blower built —46¼" waterlift.



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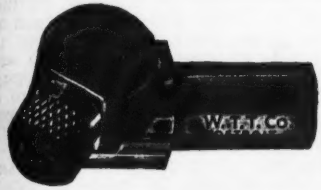


## Real Economy

Every user of diamond dressing tools should investigate the TRUCO Wheel Dresser. In addition to its economy, it is highly efficient, unusually flexible, strongly built and long in life. Diamond always remains sharp.

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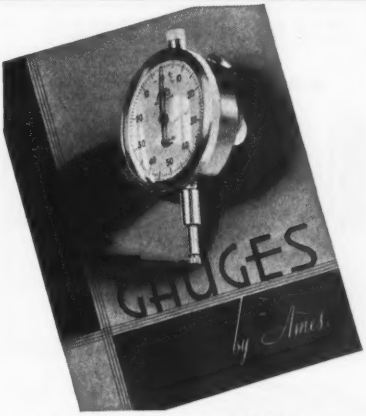
**$5.00** and up

**WHEEL TRUEING TOOL CO., INC.**
**13931 OAKLAND AVE. DETROIT, MICH.**

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**B. C. AMES Company**
Waltham · Massachusetts

# LUFKIN
## TAPES - RULES - PRECISION TOOLS

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Read what a Chief Inspector says: *"I use the LUFKIN Depth Micrometer because the numbers can be read easily and quickly—and that's important. Also because it has a locknut that keeps the reading fixed as long as you want it that way—something not found on any other Depth 'Mike'."*

And there are other reasons for preference—*The LUFKIN Depth Micrometer is the only one with each thousandth numbered; the only one with top of base knurled, affording firm grip in work.* Each gage is provided with three adjustable rods giving range from zero to 3". No. 513 has 3" base, No. 515 has 5" base.

Send for Catalog No. 7

For Accuracy, Improved Design, Finer Finish—Specify LUFKIN

NEW YORK: 106-110 Lafayette St.

**THE LUFKIN RULE CO.**
SAGINAW, MICHIGAN, U. S. A.

Canadian Factory WINDSOR, ONT.

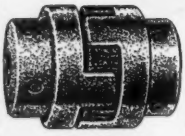
**DIAMOND TOOLS**
**FOR ECONOMY**

All types for dressing grinding wheels, Shaped Diamond Tools, etc. Large stock unset stones on hand. Resetting and resharpenings returned same day received.

**Send for price list and specify your requirements.**

**E. KARELSEN, INC.**
Established 1852
**15 West 44th St., New York, N. Y.**

**L-R FLEXIBLE COUPLING**
***everlasting***



PATENTED

Non-Lubricated—noiseless. Trouble-free. Low cost. Type "I-A"; 3/16" to 2¾" bores. Other types to 14". **Write for test sample.** Efficient — economical.

**LOVEJOY TOOL WORKS**
**5007 WEST LAKE STREET** **CHICAGO, ILLINOIS**

**EVERY SHOP** needs these rugged, accurate portable Pyrometers. L88 for checking **Surface Temperature:** 800° range with 1 ft. silver tip couple, $17.90. L89 for **Non-ferrous Metals:** 1600° range with 2 ft. couple and 1 ft. replaceable tip, $19.30. L90 for **Furnaces:** 2500° range with 3 ft. couple, $19.00. Sent on 30-Day Trial. Circular Free.

**RUSSELL ELECTRIC CO.**
**338 W. Huron St., Chicago**

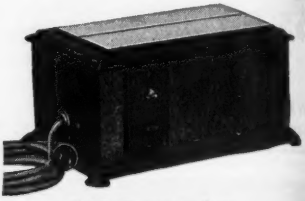
Hold-Heet Pyrometers

22 x 30½ in. and the depth of the throat is 25 in. The table casting and machine frame casting are of nickel iron, seasoned by heat treatment to assure accuracy and freedom from warpage through continued use. The third idler wheel is tiltable in the same manner as the main upper wheel to permit easy and exact tracking of the blade.

For the band filing function, an extension section is coupled into the standard Doall file band in order to obtain the extra length for this model. This model is made so that it can be used without employing the third idler wheel when jobs are to be done that do not require the deep throat capacity.

## L-W Demagnetizers

To meet the demand for a demagnetizer that will efficiently remove the magnetism from work that has become



**L-W Demagnetizer**

magnetized through induction, the L-W Chuck Co., 7 N. St. Clair St., Toledo, Ohio, has brought out two models of demagnetizers, intended for large and small work. It is stated by the manufacturer that a single pass over the stationary poles is sufficient to demagnetize the work completely.

The Model J-1 demagnetizer, intended for small work, is 7¼ in. wide, 7¼ in. long, and 6¾ in. high. Shipping weight is 35 pounds.

The Model B-2, which is built for

**ELIMINATE SPECIAL AND COSTLY JIG FIXTURES**
*By Using Yost Drill Press Vices*

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

Write us for circular "H", giving us name of your nearest dealer.

**YOST MANUFACTURING COMPANY** MEADVILLE, PA.

# UNIVERSAL COLLET CHUCKS

GRIP AS STRONG AS SOLID STEEL

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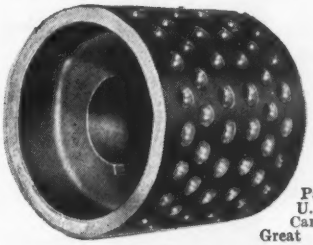

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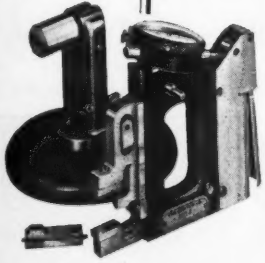

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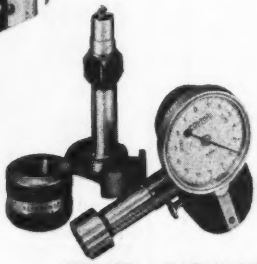

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large work, is 7¾ in. wide, 12½ in. long, and 6¾ in. high. Shipping weight is 55 lbs. Both of these models come complete with pilot light signal, switch and cord. The demagnetizer operates on 110 volt A. C. current.

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To meet the requirements of shops where precision requirements are exceptionally fine, Federal Products Corporation, 1144 Eddy St., Providence, R. I., has developed a full jeweled, low-friction dial indicator, illustrated herewith. The jeweled bearings used in the indicator reduce the internal resistance to the minimum; thus the indicator is exceptionally alert in giving the measurements of the work under inspection. The action is said to be extremely light and free, enabling the indicator point to follow the surface variations in and out, precisely and quickly.

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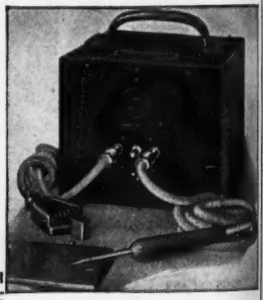

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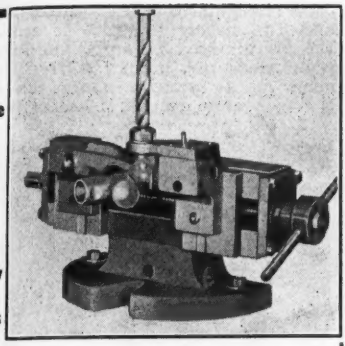

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Jaws and bushing plates are all you need to make your permanent drill jigs. The "John's" Jigs provide a base with quick clamping action for an unlimited number of drill jigs—thereby cutting future jig costs 75% in most cases.

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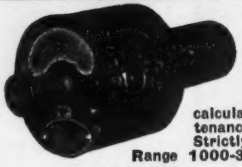

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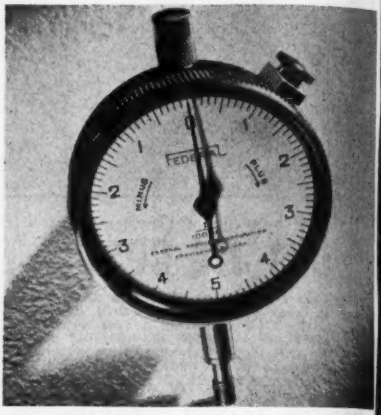
other irregularities are quickly detected and the needle "flicker" is reduced to the minimum because the indicator point does not bounce. Irregular work such as a hexagon shaft can be inspected more quickly because the indicator point does not bounce off the corners; it follows the piece closely, enabling the inspector to rotate the work fast and still obtain an accurate reading.



Federal Full Jeweled Low-Friction Dial Indicator

## Standard Long Life Shockproof Dial Indicator

The Standard Gage Company, Inc., Poughkeepsie, N. Y., has placed on the market a "Shockproof" dial indicator, illustrated herewith. The shockproof feature has been made possible through

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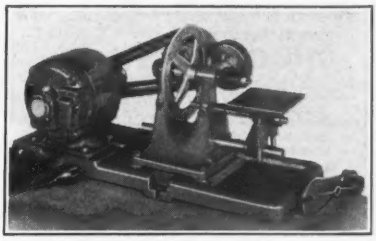

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3/16 RS 5/16

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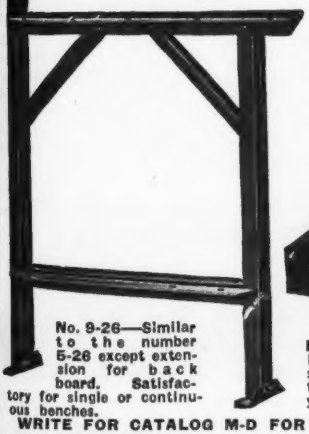
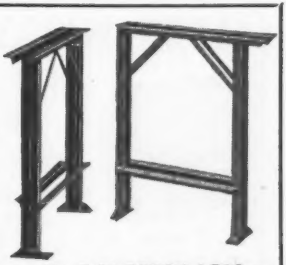
**There Is Permanence in Steel**

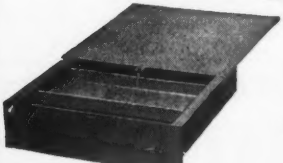


No. 9-26—Similar to the number 5-26 except extension for back board. Satisfactory for single or continuous benches.

These Bench Legs and Drawers reach you all ready for you to quickly assemble your own benches by bolting on wood top, shelf and brace.



No. 5-26 BENCH LEGS—This leg is sturdily constructed and will make a rigid foundation for any bench requirement.



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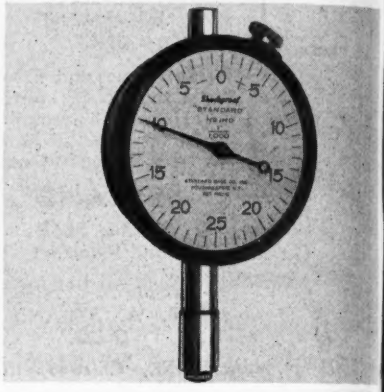
an ingenious mechanism built into the lower stem of the indicator which is so constructed that shocks, either severe or minute, are not transmitted to any part of the mechanism, thus it stated that the indicator will retain its accuracy over an unusually long period of time.

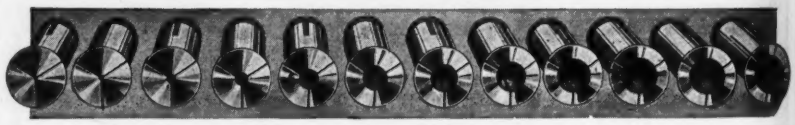
In making laboratory tests of the indicator mechanism, microscopic exami-




**Standard Shockproof Dial Indicator**

nation has failed to reveal any defects whatsoever in the gearing mechanism of the indicator even after it has been subjected to severe shocks equal to hammer blows. This valuable feature has, however, in no way changed the gearing mechanism; standard gears and pinions are used throughout. Furthermore, this indicator is interchangeable with other "Standard" indicators. The indicator is furnished as shown in the illustration, with graduations of 0.001, 0.0005, and 0.0001 in., or in 1/100 mm. and 1/200 mm.

**RIVETT DRAW-IN COLLETS AND CHUCKS**



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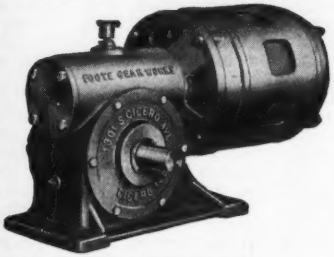
**motors may be moved without disturbing underwriters label.**



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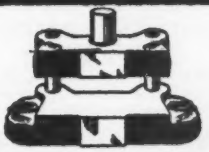

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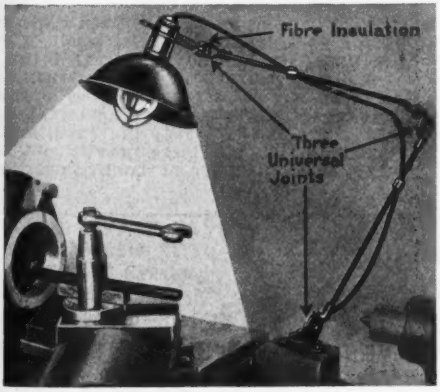


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## V & O No. 410 High Speed Notching Press

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The fixtures used on this machine are of the friction driven, positive locking type. The manner of operation is as follows: A friction band, lined with leather, driven by a crank and connections, grips the fixture and moves it forward. As the motion is reversed, a locking pawl drops into position and holds the fixture stationary during the lower part of the stroke of the machine while the punch and die are working. No driving pawl is used, therefore the life of the index ring, which is hardened and ground to very close limits, is lengthened considerably.

Particular thought has been given to designing both the press and the fixtures so that they will be readily accessible and easy to convert from one job to another. The stroke of the press is 1 in., and the depth of the throat is 9 in. The height of the die, top of bolster to bottom of slide, stroke down and adjustment up, is 7 inches.

The minimum distance from center of slide to center of fixture, small external, is 1 in., and large external, is 3 in.; small internal, 0 and large internal, 2½ in. Maximum distance center of slide to center of fixture, small external, 6½ in., large external, 15½ in.; small internal, 11¾ in., and large internal, 9½ in. Maximum diameter of laminations that

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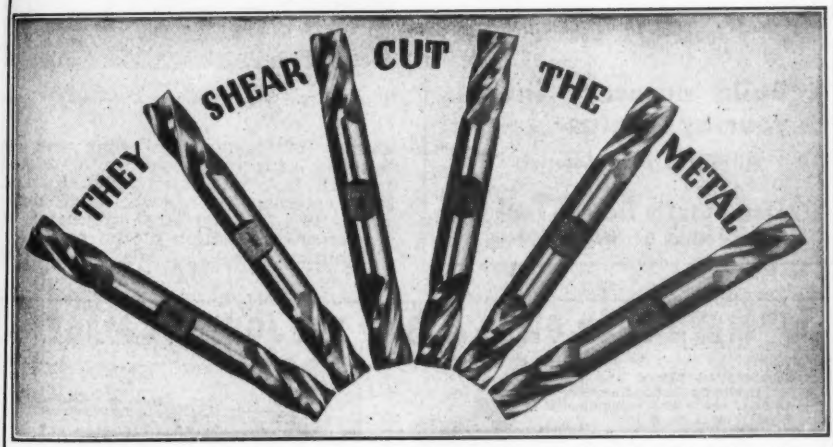


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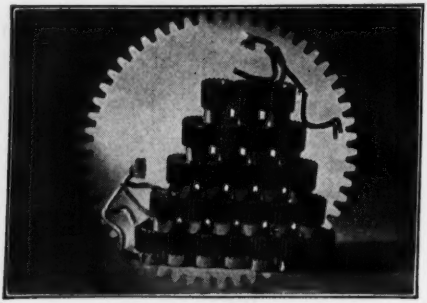

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All Types and Materials

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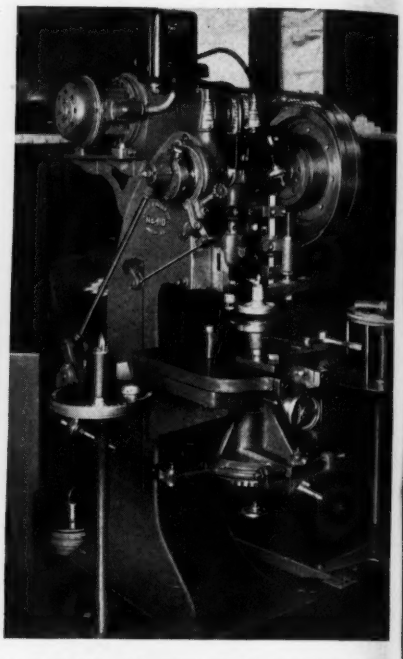
can be notched with fixture in innermost position, is small external, 20 in. and large external, 24 in. Maximum di-



V & O No. 410 High Speed Notching Press

ameter of laminations that can be notched with fixture in the outermost position is, small external, 30 in. and, large external, 48 in. The small internal is 14½ in. and large internal is 18 in. for either position of the fixture.

Minimum height of die; i.e., top of

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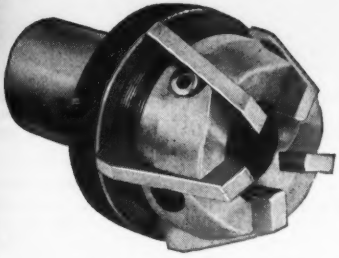

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FEATURE THE

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Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6" to 30".

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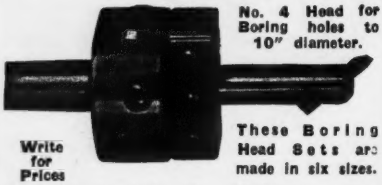

No. 4 Head for Boring holes to 10" diameter.

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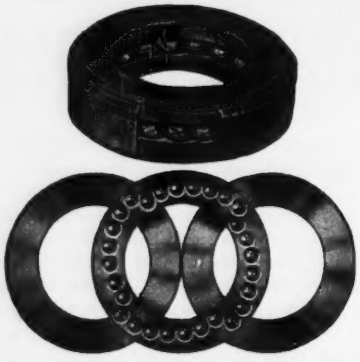
These Boring Head Sets are made in six sizes.

**C. C. Craley Mfg. Co., Shillington, Pa.**





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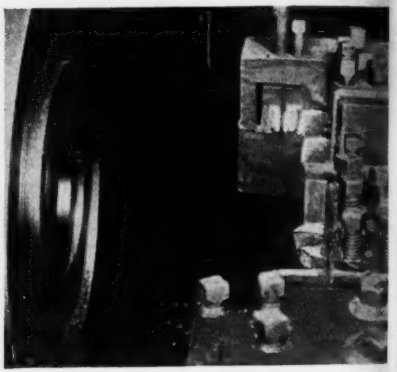
bolster to top of die is 3⅜ in. for either small or large external. Maximum height of die; i.e., top of bolster to top of die is 3⅞ in. in either case. The maximum number of notches possible with the small external fixture is 104, and with the large external fixture is 150; with the small internal fixture, 132, and with the large internal fixture, 170.

## "Crobalt" Special Cutting Alloy

Michigan Tool Company, 7171 McNichols Rd., Detroit, Mich., announces that it has taken over national distribution of a new cutting alloy which is to be known by the trade name of "Crobalt." In order to give the new



**Crobalt tools being used to machine the block side of a flywheel in a Gisholt Simplimatic Lathe. Depth of cut, ⅛ in.; cutting speed, 125 ft. per minute.**

alloy thorough tests under actual working conditions, the alloy has been used in the high production plants in Detroit during the past two years. During this time it has been found highly ad-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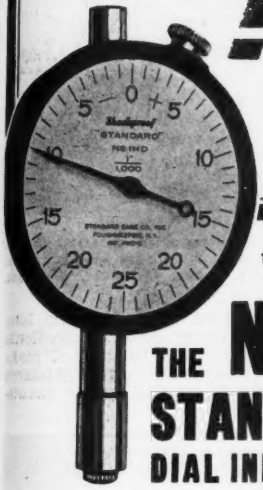


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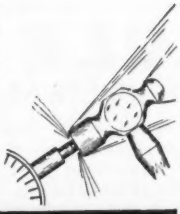

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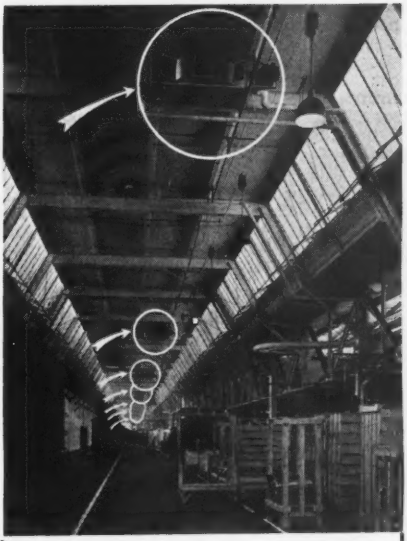

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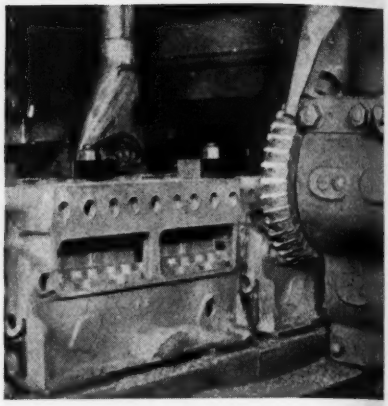
vantageous in lowering costs, increasing speeds and particularly for the cutting of cast irons.

It is stated that the relatively low cost of Crobalt makes possible the manufacture of the entire cutting tool from the alloy, avoiding the necessity of brazing tips to steel shanks. Where brazing is necessary, however, it is said that it is very easy to braze.

Crobalt is a non-ferrous, high speed cutting alloy whose major ingredients —tungsten, cobalt and chromium—are combined with certain other constituents which are said to be responsible for the alloy's high cutting efficiency and long life. Moreover, these latter ingredients are said to possess the faculty of making possible remarkably high standards of uniformity and purity in its manu-



**Using a milling cutter with inserted Crobalt blades to mill sides of cylinder blocks. Actual cutting time, two blocks, 1 minute, 4 seconds.**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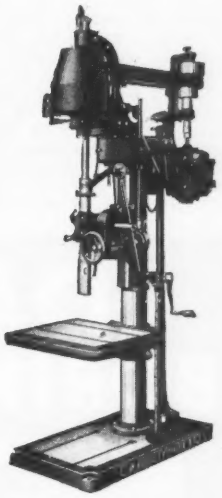
## . the C-O 21" Sliding Head Drill



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facture. The alloy is melted in electric furnaces and cast in permanent molds at temperatures of around 3000 deg. F. and it is said that its qualities are not affected by cooling after pre-heating to any temperature below that of its melting point, which is 2800 deg. F.

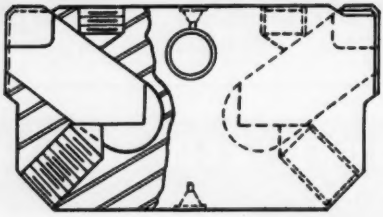
Crobalt is said to be unusually free cutting. Another feature is that productivity per grind is apparently not affected within a wide range by cutting speed or tool temperature. It has been found possible to cut iron at speeds producing red heat in the tool without lubrication. It is said that the grinding of Crobalt tools involves no special problem.

The alloy will be available in the form of both standard and special cutting tools and also in bulk to other manufacturers. In addition to turning, forming, facing and other tools, a complete line of straddle and face-milling cutter blades and assemblies is offered. Special tooling will be designed where required.

**PUTNAM HI-SPEED CUTTING TOOLS**

Putnam Hi-Speed End Mills, Counterbores, Reamers, and Special Tools are illustrated and described in a new 30-page catalog which is new being issued by The Putnam Tool Co., 2981 Charlevoix Ave. Detroit, Mich. In addition to the tools heretofore manufactured by this company, a number of new tools as for example spiral fluted chucking reamers, fast spiral solid counterbores, and end mill holders are featured. Copy free upon request.


DAVIS BORING TOOLS



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**Boyer Air-Cooled Riveting Hammers.**

The design, outstanding features and advantages in operation, of the Boyer Air-Cooled Riveting Hammer is fully outlined in a 4-page folder which is now being issued by Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. The folder explains the operation of the hammer and gives specifications for the various sizes which are available. Copy free.

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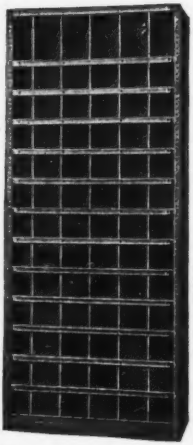

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**OPERATOR'S INSTRUCTION BOOK ON LANDIS COLLAPSIBLE TAPS.** This 12-page book, now being issued by Landis Machine Co., Inc., Waynesboro, Pa., contains three chapters as follows: Grinding Landis Tap Chasers, Operation of Landis Collapsible Taps, and General Instructions.

The chapter on grinding of Landis Tap Chasers includes, together with the descriptive text, drawings and photographs showing the contours, and rake and clearance angles for the different kinds of chasers and for different kinds of materials. The chapter on the operation of Landis Collapsible Taps tells how to replace the chasers, how to adjust the tap for thread length, how to adjust the tap for size, how to remove and replace the head, how to dismantle the tap body, and how to assemble the tap again. The chapter on general instructions deals with the subjects of cleaning, alignment and lubrication. Copy free upon request.

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**NICKEL CAST IRON DATA.** This bulletin, now being issued by The International Nickel Company, 67 Wall St., New York, N. Y., discusses thermal expansion characteristics of some nickel cast irons. Although alloyed cast iron has not generally been recognized as possessing a range of expansivity suitable for use where thermal expansion is a factor, the data presented in this bulletin indicates that it belongs in this category. The bulletin should prove particularly useful to the designing engineer. Copy free to engineers upon request.

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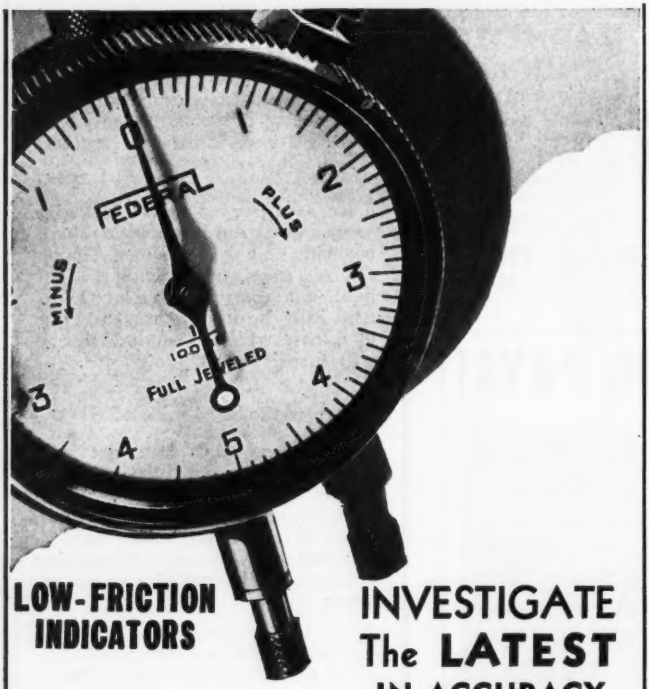
**HOLDERS FOR END MILLS AND SHELL END MILLS.** This milling machine accessory folder describes and illustrates the new line of end mill holders, shell end mill holders and adapters which is now being marketed by The Weldon Tool Company, 321 Frankfort Ave., Cleveland, Ohio. Specifications and prices are included in the folder, a copy of which will be sent free upon application to the above firm.

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